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REPORT TO THE PRESIDENT AND THE SECRETARY OF DEFENSE ON THE DEPARTMENT OF DEFENSE BY THE BLUE RIBBON DEFENSE PANEL. APPENDIX F. STAFF REPORT ON OPERATIONAL TEST AND EVALUATION

Department of Defense
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Report to The President and the Secretary of Defense on the Department of Defense

BY THE

Blue Ribbon Defense Panel

APPENDIX F

Staff Report on

Operational Test and Evaluation

July 1970

PREFACE

During the Blue Ribbon Defense Panel's study of the Department of Defense, its research staff made a study of Operational Testing and Evaluation (OT&E) in the Department of Defense.

The composition of the Panel's OT&E Task Group was as follows:

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This staff report to the Panel is considered to be of sufficient interest to top-management personnel of the Department of Defense to be included as an Appendix to the Panel's Report. However, your attention is invited to Page 20 of the Panel's Report which states that Staff Reports are being printed as information, without necessarily implying endorsement by the Panel of each of their conclusions and recommendations.

Although the individuals provided by the Military Services performed much of the research on this report, it is emphasized that they are not responsible, for specific findings, conclusions, or recommendations. Additionally, the Task Group Leader felt it would not be fair either to these individuals or to the study to attempt to obtain a consensus on issues that are often controversial and on which components of the Department of Defense may and frequently do differ.

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I. INTRODUCTION

A. Background

The Blue Ribbon Defense Panel selected Operational Testing and Evaluation (OT&E) as a Department of Defense activity requiring study. The Panel's decision that OT&E merited specific attention was based on a large number of judgments to that effect by well qualified groups and individuals both within and external to the Department of Defense.

For example, in August 1969 the Military Aircraft Panel of the President's Scientific Advisory Committee (PSAC) recommended to the Secretary of Defense that an OT&E organization be established in the Office of the Secretary of Defense. In this connection, the PSAC report stated:

> "We regard the creation of the testing and evaluation group as of the utmost importance, since we believe most of our previous failures to be prepared for wars we fight would have been thoroughly exposed had an adequate program of testing and evaluation existed. The actual tests are very expensive and since the Testing and Evaluation budget in a Service is often in competition with funds for new equipment developments, we believe it is vital that the Test and Evaluation group in OSD have a substantial budget to allocate for tests."

At about the same time, the Defense Science Board Task Force on R&D Management recommended to the Director, Defense Research and Engineering that ODDR&E should:

> "beef up test and evaluation functions - not only on weapon system products but also with regard to policies and procedures."

In the Joint Research and Development Document for FY 1971-1988, the Joint Chiefs of Staff stated:

> "Test and evaluation of weapon systems and materiel validates achievement of performance characteristics, exposes weaknesses, suggests improvements, and generates requirements for new programs. It plays an essential role throughout the life of weapon systems and materiel. Operational test and evaluation is the final essential step in the research, development, test and evaluation process; as such it needs increasing support and expansion as weapon systems become more complex and interdependent."

The above quotations are representative of a large body of opinion that OT&E in the Department of Defense has been done much less well than it should have been and that there is a potentially large pay-off for performing OT&E more effectively. It is significant that similar concern has recently been expressed by such agencies as the Bureau of the Budget, the Comptroller General of the United States and Congressional Committees studying the acquisition and effectiveness of DOD's weapon systems and materiel.

It must be emphasized that the Task Group did not start with the assumption that OT&E needed extensive overhauling - or, for that matter, that OT&E was currently being accomplished in a largely unsatisfactory manner. The Task Group did accept the judgments cited above as ample justification for the study, but approached the study without preconceptions - entirely free to make an independent assessment of how OT&E is currently being conducted.

B. Objectives

The principal objectives of the OT&E study have been to assess the effectiveness of the organization for and the conduct of OT&E throughout the Department of Defense, to determine whether significant changes are required, and based upon these findings to develop any required policy guidance for the conduct of OT&E of weapons, weapons systems, and supporting systems and equipment.

C. Method of Approach

As the first order of business, the Task Group developed a methodology for conducting its study. This is described briefly as follows:

1. Specific Study Tasks

First, it was essential to define what OT&E actually is - that is, what kinds of activities it encompasses and what results it may reasonably be expected to produce. This was not easy, since it was necessary to define it in terms that have meaning and relevance throughout the Defense establishment and not, for example, to one Service alone.

Next, it was decided that it would be useful to document selected representative OT&E efforts both from the individual Military Departments and joint efforts sponsored by OSD or JCS. The case histories might be specific operational tests or, alternatively, development programs with OT&E activities and their influence noted and evaluated. It was believed that preparing such case histories would yield insight into the characteristics of both successful and unsuccessful OT&E.

Concurrently, it was judged necessary to identify and describe existing major OT&E organizational activities throughout the Department of Defense. Through this means, it was possible to judge the importance assigned to OT&E and to understand how major DOD elements have organized to perform the OT&E function.

It has been often said, and the Task Group agrees, that individuals with experience and knowledge of OT&E are in very short supply throughout the Defense establishment. Often those who have such capabilities are no longer associated with OT&E. It was decided that it would be essential to consult with military and civilian personnel with recognized expertise in OT&E. More than 60 such individuals were identified and engaged in in-depth discussions with the Task Group.

From the beginning of the study, it was clear that the Task Group must assess the facilities (ranges, instrumentation, etc.) available throughout the DOD for conducting OT&E, both from the viewpoint of current adequacy and whether they can fulfill requirements for future OT&E. A closely related subject, which also required study, is the adequacy of funds for the support of necessary OT&E - both that conducted (or not conducted) by the Services and the joint efforts initiated by the higher-than-Service levels of the DOD.

The Task Group also decided to investigate the extent to which large private industry conducts OT&E, in order to evaluate whether the DOD can learn worthwhile lessons from that source.

2. Critical Issues

The Task Group concluded that the objectives of the OT&E study could be most meaningfully achieved in the context of a limited number of critical issues. These issues were expressed as questions (or sets of related questions) for which answers would both clarify the current DOD-wide OT&E situation and indicate specific actions which might be required to improve that situation. These important issues are as follows:

a. What is encompassed by the term "operational testing and evaluation"? What are, or should be, the goals of OT&E?

b. At what points in the life cycle of a military system, and in what ways, can OT&E be useful? Most pertinently, can OT&E provide meaningful inputs to military decision-making? If so - where, when, and in what manner?

c. Are the Military Departments accomplishing OT&E to the extent and with the effectiveness required? What organizational relationships within the Military Departments most effectively support productive and objective OT&E programs?

d. Is there a requirement to change DOD policy and/or organization so that OT&E can be more productively and objectively accomplished and/or the results of OT&E more effectively used? Specifically, should there be a "higher-than-Service" OT&E organization? If so, where should it be located and what should be the scope of its responsibilities and authority? What kinds of people should be assigned to such an organization?

e. What is the adequacy (capabilities and limitations) of DOD facilities for accomplishing OT&E? Is there unnecessary duplication? Is there a need for new and different facilities and/or methods for controlling their use?

f. How should OT&E be funded throughout the DOD? Would increases in funds or changes in methods of funding result in improved OT&E?

II. CONCLUSIONS

1. There are major differences among elements of the Department of Defense as to what Operational Testing and Evaluation encompasses; what its objectives and contributions are, or should be; and what organization and methods are required to accomplish it most effectively.

2. OT&E has four principal objectives:

a. To provide information to the Research & Development community that will assist in the development of new systems.

b. To establish the characteristics and capabilities and limitations of such systems and equipment in order to assist in planning force size and force structure.

c. To develop tactics and techniques for employing new systems or old systems which must be adapted for new uses.

d. To determine whether weapons, weapon systems, and supporting equipment fulfill up-to-date military requirements (which may be substantially different from the requirements which led to development).

3. OT&E can and should contribute significantly to decision-making at all levels of the DOD. However, unless the process of acquiring military materiel is radically altered, it is improbable that OT&E can be done in time to provide "go-no go" recommendations on whether to commence production of operationally-configured major systems.

4. The quality of OT&E is very uneven. There is no question that military OT&E can and should be planned and executed much more effectively than it has been in recent years.

5. The results of the OT&E which has been accomplished have not been adequately made available to or used by DOD agencies which need them. There is no method of evaluating and preserving such information.

6. OT&E is not adequately managed or supervised at OSD level.

7. There is a requirement for an OT&E organization at "higher-than-Service" level to insure that OT&E, throughout the DOD, is more productively accomplished and its results more effectively made available and used.

8. Existing ranges and other facilities have been marginally adequate to support the OT&E which has been performed. There is well-founded doubt concerning their adequacy for OT&E which should have been bu was not performed. There is serious concern as to whether future requirements for such ranges and other facilities can or will be met.

9. OT&E within the Services is done most effectively when OT&E organizations report directly to the Chief of the Service, representing both the developer and user, but organizationally independent of both. There are, however, considerable forces within the Services which resist the independence of OT&E organizations.

10. There has been, and is currently, no effective means for conducting productive joint operational tests and evaluations. The fact that some such efforts (for example, Joint Task Force Two) have encountered difficulties and achieved few useful results does not obviate the requirement for much-needed joint OT&E.

11. There should be a specific and substantial OT&E budget (administered by the "higher-than Service" OT&E organization) to allocate for the most needed OT&E or to augment Service OT&E budgets to obtain data required for high-level studies or decision makers.

12. There is a shortage of experienced and capable personnel directly involved with OT&E. There has been inadequate use of civilian scientists and operations researchers/systems analysts in OT&E at all levels, but particularly where operational testing is actually being planned, conducted, and analyzed.

13. Conduct of needed OT&E is being adversely affected by inadequate funding and particularly by the lack of budgetary identity for OT&E funds.

14. The Weapons Systems Evaluation Group has more capability to support OT&E than is being used, and this capability could be increased by judicious assignment of military personnel and the use of qualified contractor personnel.

III. RECOMMENDATIONS

1. Establish an Operational Testing and Evaluation Group, with civilian leadership, within the Office of the Secretary of Defense, reporting directly to the Deputy Secretary of Defense.

2. Consider establishing a Defense Test Agency with broad authority and responsibility for DOD test activities and giving particular emphasis to OT&E.

3. The Secretary of Defense should communicate to the Military Departments the importance he assigns to the accomplishment of productive, objective, and timely OT&E, including his conviction that the cause of effective OT&E is best served when independent OT&E organizations report directly to Chiefs of Service, Service Secretaries - or both.

4. An early task and continuing responsibility of the OSD OT&E group should be to develop means to insure that productive joint OT&E is accomplished when it is needed.

5. A substantial budget for OSD-sponsored OT&E should be provided, and administered by the OT&E group.

6. Require the Services to budget separately for an OT&E program element.

7. Require the Weapons Systems Evaluation Group to increase its capability to perform OT&E tasks. Assign selected OT&E tasks to WSEG as it develops the required capability to accept them.

IV. DISCUSSION

A. The Nature of Operational Testing and Evaluation

The term "operational testing and evaluation" is not well understood throughout the DOD. Probably it would be more accurate to say that it means different things to different people. Understandably, there have been many attempts to define OT&E with some precision. These efforts are generally unproductive - or counter-productive. It is not desirable to force OT&E into artificial and unnecessary constraints.

A major goal of OT&E is to determine in advance the effectiveness (in terms of capabilities and limitations) in the ultimate operational environments (usually combat) of military weapons, weapon systems, supporting systems and equipment, tactics and techniques, and organizational arrangements. It should be emphasized that OT&E is dynamic, for not only is the operational environment changing but so are the new systems and the new uses for old systems.

It has been customary to think of OT&E in terms of physical testing (under various designations such as operational suitability testing, employment testing, or field experimentation). Operational testing is a very important activity (which has often been done poorly), but it is emphasized that the goal is operational evaluation and that physical testing is only one means of performing operational evaluation. This is an important point since it is often argued that operational testing must await production of an adequate number of operationally-configured systems; and by this time it is too late to use the information gathered to help decide whether to produce the new system or even to influence in any significant way the nature of the system procured.

Thus, OT&E, as a total process, if it is to be effective, must extend over the entire life cycle of a system, from initial requirement to extending its life by adaptation to new uses. It must use analytical studies, operations research, systems analysis, component testing, testing of other systems, and eventually testing of the system itself.

Much OT&E does, however, involve physical testing; and therefore it is important to distinguish between "functional" testing and "operational" testing. Unfortunately this distinction is often poorly made within the DOD system acquisition process, and there is a disturbing (and apparently increasing) tendency to accept the results of functional testing as indicative of operational capability.

Functional testing (often called "engineering testing") is routinely done by both contractors and developing agencies of the DOD. It is intended to determine how well various systems and materiel meet the design and performance specifications which were written into the contracts which produced them - in other words, whether they meet technical requirements.

Operational testing, on the other hand, is done to determine insofar as possible, whether such systems and materiel are capable of fulfilling operational requirements. Operational testing must help predict in advance the capabilities and limitations of systems when they are subjected to the stresses of the environment for which they were designed (usually combat). It must take into consideration the interface with other systems and equipment, tactics and techniques, organizational arrangements, and the human skills and frailties of the eventual users. We can be certain that knowledge or estimates of the operational environment will change significantly during the relatively long time a system is under development, and operational testing must be keyed to the most likely conditions of use rather than the requirements for which the system was developed. A system which functions perfectly but cannot cope with the threat for the time period when it is available is worse than useless. Operational testing, along with continuous operational evaluation, can help us avoid such unfortunate situations.

B. The Role of OT&E in Military Decision-Making

In recent years there has been a growing desire, particularly at the OSD level, to use data from OT&E as inputs to the decision-making process. The decisions that have to be made at this level concerning system development and future force composition are often very difficult. Customarily they must be made in an atmosphere of claims

and counter claims by proponents of competing systems. Often there are almost no hard data to assist in the decision process. Therefore, especially during the past decade, decisions have been predominantly based on analytical studies - which have in turn been highly sensitive to important initial assumptions.

Thus, it is not surprising that there is great concern about the difficulty of obtaining valid quantitative inputs to replace or support such critical assumptions. Clearly, it would be very valuable to obtain credible quantitative data from realistic and relevant operational testing.

Unfortunately, it has been nearly impossible to obtain test results that are either directly applicable to decisions or analyses or which can be credibly extrapolated for that purpose. Often test data do not exist. When they do, their usefulness for comparative analyses is generally limited seriously by the fact that tests are seldom designed or test conditions sufficiently controlled to permit valid comparisons. It is especially difficult to obtain any quantitative information in time to assist in decision-making.

This question of timeliness is extremely important. For this reason it is essential to dispel the widely-held belief that useful OT&E must await the completed product of R&D - that it is or should be limited to the testing and evaluation of production systems. It is important, as will be indicated below, to perform OT&E on operationally-configured production systems, but if the OT&E process only commences at that point it misses most of the opportunity to influence that product on behalf of the operational forces - the ultimate "users."

There are four important ways in which OT&E can provide inputs to military decision-making:

1. OT&E can provide essential inputs to help with decisions as to what kinds of new weapons or systems should be developed and what capabilities will provide worthwhile increases in total force effectiveness. This assistance is in the form of obtaining and making available accurate quantitative information on the capabilities and limitations of the products of R&D currently in the hands of the operational forces. Unless it has such

information the R&D community cannot know what is required to increase capabilities in future time periods. There is no doubt that such quantitative information on current systems is often deficient and surrounded with uncertainties. Such information is an essential element in validating requirements - that is, making certain that requests for new systems, and the risks inherent in them, are actually justified.

2. OT&E can and should be done in time to provide important inputs to decisions regarding the size and composition of military forces. Decisions about how many of each of several systems must be based upon some degree of knowledge, or estimates, of the effectiveness of each system as a component of the force mix to meet a spectrum of contingencies. Realistic testing can provide valuable information to high-level decision-makers when only a fraction of production has been completed and when significant alterations to overall force composition are still possible.

3. OT&E is particularly helpful in developing tactics and techniques for employing new systems or adapting old systems to new uses. This is the kind of OT&E which should be, and often is, conducted by the operational commands equipped with the systems in question. The results of such OT&E are essential to the operational commander in making decisions related to planning for and conducting combat operations, and in devising and carrying out the training necessary to maintain operational forces in a state of readiness.

4. Traditionally, an important objective of OT&E was to test production systems and obtain data on which to base decisions as to whether to continue or discontinue production. Unless there are radical changes in the process by which DOD acquires major systems, it is unlikely that operational testing can play the major role in such decisions. If, however, the practice of concurrency were lessened and true prototypes were built for pre-production operational testing, then OT&E could contribute in a major way to such "go-no go" decisions.

To accomplish the important purposes cited above, an effective program of OT&E must start with the earliest requirements and continue, with appropriately changing emphasis, for the life of a system. It should be pointed out that to conduct this "life-time OT&E" it is not necessary to conduct a different type of testing to fulfill each purpose and satisfy each "customer." There is a great deal of overlapping, and in large measure a generalized program of OT&E can assist with all purposes.

C. OT&E at Higher-than-Service Levels of DOD*

There has been increasing interest in OT&E at the higher-than-Service levels of the DOD. This interest is mainly attributable to the desire to obtain hard data of operational validity which will assist in making decisions and hopefully reduce the chances that incorrect decisions will be made.

Despite such high-level interest, participation in OT&E by OSD and JCS has been limited and fragmented. There is no organization at such levels with the overall responsibility for either deciding what OT&E should be done and for what purposes or for following through to insure that the desired OT&E is done in a scientific and timely manner and that the results reach those who need them.

The OT&E picture at OSD and JCS is dismal, and there is little if any indication that it will improve. This is particularly unfortunate, for without such leadership the quality and extent of OT&E throughout the DOD cannot help but suffer.

1. OSD OT&E Activities

The Directorate of OT&E of ODDR&E was established in 1966 under the Deputy Director (Administration and Management). Although establishment of this organization was recognition of a need for attention to the operational aspects of testing and evaluation, its authority and resources have been limited from the beginning. It has had very little influence in seeing that adequate OT&E is carried out in the DOD. This small organization has been completely military and has lacked both the continuity and specialized technical expertise necessary to formulate and conduct an effective program.

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*See Appendix A for a more complete description and discussion.

Furthermore, the location of the organization in a lower echelon of a developer organization has militated against the independence of action and access to the higher levels of decision-making which are prerequisite to effective representation of the user.

In February 1968, the Assistant Director (Chemical Technology), ODDR&E, assumed cognizance over the Deseret Test Center Joint Chemical/Biological Operational Test & Evaluation activities from the Assistant Director (OT&E), ODDR&E. This was a further dilution of the latter's mission, and further fragmentation of OT&E responsibilities within OSD. This change occurred when the Army's Dugway Proving Ground was merged with the Deseret Test Center. Currently the part of the Deseret Test Center program involving joint offensive weapon OT&E faces an uncertain future because of the Presidential moratorium in this activity.

The Assistant Secretary of Defense (Systems Analysis) has been the most vocal supporter of increased OT&E for and by OSD. Until recently, Systems Analysis prepared Draft Presidential Memoranda on General Purpose, Strategic, and other military forces. Currently, it performs analyses of alternative force structures, and reviews Service budget requests for new weapon systems. In all these endeavors, Systems Analysis has felt the need of OT&E data not only on the capabilities of new systems but also on the capabilities of systems in the hands of operational forces.

The Weapons Systems Evaluation Group (WSEG) was established in 1948 with the mission, among other things, of conducting evaluations for the Joint Chiefs of Staff and the Secretary of Defense. WSEG has been reactive rather than anticipatory and has carried out OT&E through a series of ad hoc studies and tests which were organized only after a major problem developed.

Actually, WSEG has only been minimally concerned with actual involvement with the design, conduct, and analysis of physical operational testing. It was, however, involved in the 1950's with the large scale joint ECM tests and exercises called WEXVAL. More recently it had a major part in establishing Joint Task Force Two and participated to some extent in its activities until its disestablishment. In 1967-68, it undertook an operational test of the M-16 rifle in a simulated

environment in Panama; this OT&E effort is generally regarded as highly successful. WSEG receives its tasks from ODDR&E and JCS and is not ordinarily regarded as an OT&E organization.

2. JCS OT&E Activities

At the present time, there is very little involvement of the Organization of the Joint Chiefs of Staff in OT&E, and apparently even less desire to be so involved. The JCS do not consider that OT&E properly falls within their purview.

The JCS have from time to time sponsored large scale joint exercises and joint task forces. Some of the latter have achieved considerable permanence. For example, Joint Task Force Eight was hurriedly created in 1961 to facilitate resumption of atmospheric nuclear testing. It will be disestablished in July 1970.

It is probable, however, that much of JCS' reluctance to participate directly in joint OT&E is owing to Joint Task Force Two, which was established in 1964 and disestablished in 1968. JTF-2 was a response to a demonstrated need to learn more about the problems associated with low level penetration and mission performance by aircraft. There is very little to show for an expenditure on the order of 80 million dollars; however, it can and has been argued that the JCS terminated the organization just as it was on the verge of producing highly useful results.

At the same time JTF-2 was being disestablished (April 1968), the then Deputy Secretary of Defense (Mr. Nitze) requested the JCS to consider establishment of a small Joint Test and Evaluation agency, which would be an extension of the Joint Staff similar to The Special Assistant for Strategic Mobility. The JCS lost no time in replying (May 1968) that they had considered the suggestion and had concluded that such an agency was unnecessary. The reply went on to express the belief that there already existed within the Organization of the JCS, the Services, and other agencies the capability to plan, conduct, and evaluate the results of operational tests, including tests which involved joint issues. It is amply evident that this capability does not exist and that the ad hoc testing on which the JCS relies produces very little useful data to support high-level decision making.

The JCS might have argued more convincingly that there was a need for such an organization, but that the Organization of the JCS was not the place to establish it.

3. Assessment of OT&E at Higher-than-Service Levels of the DOD

As indicated in the foregoing discussion, several elements of OSD and the Organization of the JCS engage in some OT&E activity. The principal characteristic of such activities, however, is that they are fragmented. None of them has the responsibility for overseeing DOD OT&E as a whole - including that which is carried on by the individual Services. In fact, such higher-than-Service OT&E activities appear to have very little communication with each other. There is no focal point at OSD or JCS level to which one can apply for information regarding policies, procedures, organizations, and facilities for conducting OT&E of systems and equipment within the DOD.

Thus, there is no organized capability at higher-than-Service level to take a broader view toward OT&E than is possible within the Services. The requirements for data from OT&E at the higher levels differ very considerably from those of the Services. Some mechanism is needed to place in perspective the more narrow Service viewpoints and to reduce the institutional bias which is prevalent in Service OT&E undertakings. No effective means currently exists to identify to the Services the OT&E derived data which are required at OSD and JCS level for decisions involving development, force structure, and contingency planning.

In general, the supervision of OT&E of strategic missiles by OSD and JCS is adequate. The Deputy Director (Strategic and Space Systems), ODDR&E, exerts considerable influence on OT&E activity and facilities for evaluating strategic missile performance. In addition, WSEG studies in the area of OT&E of strategic missiles have been effective in influencing methods for such evaluations.

On the other hand, the supervision of OT&E of non-nuclear systems provides the best example of fragmentation and ineffective higher-than-Service supervision.

The Assistant Director (OT&E), ODDR&E, has the principal responsibility for OSD's interests in and supervision of non-nuclear OT&E throughout the DOD. This directorate has been largely ineffective for the four years it has existed. In part, this is because of inadequate manning; but, more importantly, its location within ODDR&E (a development agency) has inhibited effective performance in the OT&E of the products of the development process. There is extremely little productive relationship between the Assistant Director (OT&E) and Service OT&E personnel and agencies. Sometimes the latter were not aware that there was such an organization within the OSD.

Two other OSD offices monitor, and in some respects supervise, aspects of non-nuclear OT&E, but their functions duplicate or overlap those assigned to the Assistant Director (OT&E). These offices are the Assistant Director (Chemical Technology), ODDR&E, which provides OSD attention to joint OT&E of chemical and biological weapons, and the Defense Communications Planning Group, which directs both the testing and operational employment of certain automated sensor devices.

JCS relies on an ad hoc approach to joint OT&E. This technique which usually involves establishing a joint task force to apply OT&E to important problems has very serious shortcomings. First, such problems only become candidates for JCS attention when they become urgent; JCS has no mechanism for anticipating such problems. Second, the ad hoc joint task force approach is subject to delays inconsistent with a sense of urgency, and the problems associated with mobilizing the required operational and scientific expertise are often inadequately solved. The not-surprising result is a history of ineffective joint OT&E efforts.

The Weapons Systems Evaluation Group is responsive to the JCS for studies and, upon occasion, OT&E. For example, in 1967-1968, WSEG conducted an urgent, effective, and influential operational test of the M-16 rifle. WSEG is not manned either with officers or civilian contractor personnel with the objective of maintaining a capability for OT&E. Nevertheless, it is evident that WSEG has a greater capability in the OT&E area than is being used; and if the decision were made to do so this capability could be substantially increased.

D. Operational Testing & Evaluation in the Services

In the sections describing OSD and JCS OT&E activities, there was no mention of any control or important influence which these higher levels have on the OT&E performed by the individual Services. Currently, and historically, there has been no OSD direction, either formal or informal, in this area. OT&E done by the Services has been and remains the prerogative of the Services.

In view of the absence of any regulation or guidance from higher authority, it is not surprising that the Services have differed substantially both in OT&E philosophy and in organization to carry out and report on OT&E activities. Methods and procedures for performing OT&E functions have changed in all Services, to a greater or lesser degree, over the past 20-odd years. There have never, however, been such large differences as now exist. These are most evident in the matter of organization. There are three basic ways to organize for OT&E:

1. An independent organization reporting directly to the Chief of Service.

2. An organization under the developer.

3. An organization under the user.

At the present time, all of the above organizational alternatives may be found in the Services.

The following brief accounts highlight the salient features of organization for and conduct of OT&E in the Services.

1. OT&E in the Army*

The Army system of testing and evaluation is currently being reorganized to place more emphasis on OT&E - and particularly on

*See Appendix B for a more complete description of Army OT&E

achieving significant operational testing as early as possible in the development cycle. The objective is to introduce the results of valid operational tests into decisions regarding whether to produce a system - and the extent of production. This means a continued and increasing overlapping of the Engineering Tests which determine whether systems and equipment meet technical specifications and Service (user-oriented) Tests which provide data on the extent to which military specifications are met. The principal method of compressing time and testing will be the Operational Service Test which is scheduled to be completed and evaluated prior to a decision to commence full production. The objectives of these revised procedures are unexceptionable; however, it will be several years before it can be determined whether they have resulted in substantially-improved OT&E.

In the current Army system, OT&E is subordinate to organizations which are also responsible for development of the systems and equipment tested. Both Engineering Tests and Service Tests are performed by the Army's Test and Evaluation Command (TECOM) which is a subordinate element of the Army Materiel Command (AMC). TECOM performs Engineering Tests at a number of proving grounds, and Service Tests are conducted by specialized TECOM boards which represent and are collocated with elements of the user. TECOM will also be responsible for performing and reporting on the new Operational Service Tests. However, new testing regulations will require formal written comments from the appropriate Center Commander (Armor, Infantry, etc.) to be attached to reports of Operational Service Tests which will be submitted directly to the Department of the Army.

There is a basic problem with the Army system of OT&E since the developer (albeit through a subordinate agency) tests and evaluates the operational suitability of the systems developed. The Army's apparently official position in this regard is that despite organizational affiliation, TECOM, by virtue of individual and organizational integrity, is able to maintain independence and objectivity; and that its location in the Army hierarchy is an administrative convenience which does not adversely affect its performance of OT&E. In 1966, and again in 1969, the organizational location of the Test Boards and TECOM was reviewed at high level, and the decision was to maintain the status quo. Though

the location may be expedient, it is far from ideal. No matter what safeguards are built into the system, theoretically it is not in the interests of unbiased and objective OT&E to have those who perform it report through the developer to the Chief of Staff level where important decisions may rely extensively on test results or expert but basically subjective evaluations.

For the past decade, the Army al[illegible]s conducted a kind of testing which it has designated "field experimentation." Field experimentation is not under the developer, nor is it under the user. Rather it is performed by an organization which attempts to represent the interests of both developer and user: the Combat Developments Command Experimentation Command (CDCEC). A field experiment is described in Army Regulation 71-3 as:

> "a controlled exercise conducted to collect objective data on a specific problem area for use in developing or evaluating new or improved operational and organizational objectives, concepts, tactics, techniques... Field experiments are conducted under controlled and instrumented conditions..."

Field experimentation represents a forward look by the Army in one type of OT&E. Results obtained by field experimentation are quantitative and provide useful inputs both to the developer and the user. It has also had a salutary effect throughout the Army in upgrading testing methodology and facilities. There is considerable evidence that field experimentation, and the Army personnel who have participated in field experimentation, have achieved an increased awareness in the Army that there is a need to perform OT&E more effectively in the future than has been done in the past.

There is also little doubt that field experimentation has been less successful than was hoped for when it was established or confidently anticipated even after several years of testing operations. It appears to have become in recent years less responsive to the needs of the developers and the operational forces, particularly the latter. There is a growing body of judgment within the Army and elsewhere that CDCEC's increasing preoccupation with instrumentation and simulation

(and the inevitable loss of operational realism) is a disturbing trend. There appears to be a requirement to re-evaluate both the objectives and methods of field experimentation to assess the extent to which this innovative and conceptually worthwhile Army testing activity is living up to its early promise.

2. OT&E in the Navy and Marine Corps*

Navy. The Navy system of OT&E has two principal characteristics: (1) it is mainly implemented by an independent OT&E organization which reports directly to the highest Service level (Chief of Naval Operations), and (2) there is a formal way of getting operational evaluation (including some relevant operational testing) done early in the overall testing and evaluation process.

The independent Navy organization responsible for most Navy OT&E is the Operational Test and Evaluation Force (OPTEVFOR). OPTEVFOR reports directly to the Chief of Naval Operations on the results of its tests. OPTEVFOR is a relatively small organization and does not command forces or maintain its own test ranges, instrumentation, and other facilities. It does maintain small test squadrons and detachments. The total strength of OPTEVFOR is approximately 1400 officers and enlisted men.

The emphasis of OPTEVFOR is on conducting OT&E without elaborate measurements or sophisticated test design. In making evaluations, there is great reliance on the judgment of individuals who have come to OPTEVFOR with recent and relevant operational experience and who after relatively short tours (perhaps two years) will return to operational assignments. Only very rarely do such individuals serve long tours with OPTEVFOR or return for subsequent tours.

Technical and/or Operational Test and Evaluation is presently conducted on all weapon systems and/or components by OPTEVFOR prior to release for procurement except where Chief of Naval Operations specifically authorizes limited or pilot production prior to completion of testing. Such authorization is occasionally considered necessary on complex systems such as aircraft in order to test the products of production type tooling and to facilitate the transition from prototype to production.

*See Appendix C for a more complete description of Navy and Marine Corps OT&E

The Navy stresses operational evaluations at an early stage of development - that is, at a time when it is still possible to make significant changes if findings warrant. Obviously, such early evaluations fall far short of what is often believed to be true OT&E. However, their emphasis is on the early assessment of operational suitability and timely identification of p tential operational shortcomings. It is believed that trading off operational realism for timeliness makes a worthwhile contribution to placing more effective systems in the hands of operational forces.

An example of such early assessments is the Naval Preliminary Evaluation (NPE) which is conducted on naval aircraft. Very soon after first flight (within 90 days or so) well-qualified officers will conduct a NPE. This will involve flying the first or second aircraft, even though it will be far from operationally configured, to learn all that can be learned at that time about operational suitability. Usually there will be subsequent NPE's of the aircraft at appropriate intervals and as something closer to an operational system is evolving. The important features of NPE's are that they are timely, are performed by highly-capable operational personnel, and are reported to a high enough level so that necessary actions can be taken promptly.

Other operationally-oriented evaluations occur even before first flight. For example, the mock-up of a proposed cockpit configuration may be evaluated by personnel of OPTEVFOR's VX squadrons and of the Naval Air Test Center so that operational inputs on behalf of the eventual user may be made early in the development process.

Before Navy aircraft and ships are approved for use by the operational forces, they are subjected to another kind of operational evaluation, which is much closer to true OT&E. This is done by a Board of Inspection and Survey (BIS), which is composed of experienced officers with appropriate Navy backgrounds.

When an aircraft is declared ready for BIS trials by a NPE board, a board consisting of especially-qualified officers from the test centers involved (for example, Naval Air Test Center; Naval Missile Center for air-to-air and air-to-surface missiles; Naval Weapons Evaluation Facility for nuclear weapons; etc.) is convened to conduct the tests under the BIS command for air.

When ships leave the shipyard, they are given an acceptance trial or underway trial by a permanent BIS force which has its own officers assigned, some direct from the fleet, others with specialized qualifications in various ship systems and shipyard background. Later before the contractor's guarantee expires, usually within six months, the BIS performs a final contract trial on the ship (or submarine) and makes its final report to the Secretary of the Navy.

BIS trials are not commenced until the system to be evaluated has approached operational configuration. The BIS reports are made directly to the Secretary of the Navy with a second copy also sent to the Secretary via the Chief of Naval Material and Chief of Naval Operations for any comments they may have.

The Navy is probably the most logically organized of the Services to perform objective OT&E. The main deficiency in Navy OT&E is that it generally produces fewer hard data on new or existing weapon systems and equipment than would be considered desirable. It relies too much on the collective judgment of well-qualified officers, and does not take adequate advantage of the testing techniques that are available for obtaining measurements of scientific validity. This is apparently Navy OT&E philosophy and not any inherent inability to do more scientific testing in the OT&E phase. It does mean, however, that higher level study organizations, such as Assistant Secretary of Defense (Systems Analysis), find it very difficult to obtain scientifically valid data from Navy operational tests which they can use in comparative analyses.

The Navy OT&E system, however, has the important advantage of direct access to the Chief of Naval Operations (and upon occasion, the Secretary of the Navy) so that when test results dictate expedited action there are no intervening echelons with built-in delays and interests which must be protected.

Marine Corps. The Marine Corps does not have an organization which is devoted solely to OT&E. Marine Corps OT&E consists principally of expanded service tests, troop tests, and special operational evaluations. The Commandant of the Marine Corps tasks the Commanding General, Marine Corps Development and Education Command (MCDEC), with having such tests done.

In the absence of a dedicated OT&E organization, the Marine Corps ordinarily uses Fleet Marine Force units for its tests. The MCDEC develops test plans in cooperation with the Fleet Marine Force units involved, and when the tests are completed MCDEC prepares test reports, including pertinent recommendations, and forwards them to the Commandant, Marine Corps.

In those joint programs where the Army, Air Force or Navy does the development and testing, the Marine Corps participates as required and provides appropriate resources (funds, personnel and equipment). When another Service has statutory responsibility for developmental action that also satisfies a Marine Corps requirement, the OT&E done by that Service is usually accepted by the Marine Corps as the basis for procurement. For major items of equipment (aircraft, tanks, armored amphibians, weapons) the Marine Corps depends on the other Services for the technical development, and in most cases the operational testing, with varying degrees of participation by the Marine Corps.

The Marine Corps Development Center located at Quantico, Virginia, and subordinate to MCDEC is the principal RDT&E field activity of the Marine Corps. It also maintains a West Coast Test Branch at Camp Pendleton, California. Actually the facilities at Quantico have limited capability for OT&E and are oriented primarily towards conduct of studies, development of tactical doctrine, development of requirements, supervision of Marine Corps sponsored R&D programs, and monitoring R&D programs of other Services.

The West Coast Test Branch is mainly concerned with service tests on equipment peculiar to the Marine Corps and primarily for employment in the amphibious environment. It does do some testing of Army-developed vehicles to determine their suitability for Marine Corps use, also in an amphibious environment.

Requirements for funds to support Marine Corps OT&E are routinely included in the Department of Navy RDT&E appropriations. They are part of the project or element they are to support. There is no specific program element for Marine Corps OT&E.

3. OT&E in the Air Force*

The Air Force currently has the most formal and structured system of testing to be found in the Services. The components of the Air Force testing cycle are defined with considerable precision by Air Force Regulations. Basically, testing and evaluation is divided into two major types: Acquisition Testing and Operational Employment Testing.

Acquisition Testing is made up of three categories. Categories I and II are essentially R&D testing and are the responsibility of the Air Force Systems Command (AFSC). Category I is actually performed by contractors, usually using contractor facilities, and has little or no operational flavor. In most instances, Category I tests are of individual components and subsystems. Category II is done by AFSC, with the contractor still very much involved. Ideally, Category II is of a complete system in as near an operational configuration as practicable at that stage of development. In actual practice, Category II tests seldom are operational in nature. Both the operational command which is to be the ultimate user and the Air Force Logistics Command (AFLC), which is responsible for lifetime support of the system, are required to monitor Category I and II testing.

Category III is the first Air Force testing that can be called OT&E. Category III comprises tests and evaluations of operationally-configured systems and is done by the appropriate operational command - the ultimate user. Both AFSC and AFLC remain involved in supporting roles.

Operational Employment Testing is pure OT&E. It is conducted by the using command and is closely related to integrating the new system into that command. Its objectives include the development of tactics and techniques of employment, identification of operational problems which earlier testing may not have revealed, and validation of requirements for system modification. This kind of testing places great emphasis on realism of environment and missions, and limits the personnel skills and support to those that would be available in such an environment.

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* See Appendix D for a more complete description of Air Force OT&E

Strategic Ballistic Missile Testing is subject to unique objectives and constraints. There are Category I and II tests which are roughly similar to those described above. These are followed by Demonstration and Shakedown (DASO) Tests, which are related to Category III testing. (DASO is prescribed by the JCS and is also conducted by the Navy on its strategic missiles.) DASO evaluations are conducted by the operational command (that is, the Strategic Air Command), assisted by the agency having Air Force engineering responsibility. Every practicable effort is made to have such evaluation performed in an operational environment using operational personnel and procedures. The degree to which this is achievable is, of course, less than for systems such as aircraft. Ballistic Missile Operational Tests come closest to true OT&E of strategic ballistic missiles. Their main objectives are to assess operational reliability and accuracy, and they include a fixed number of launches (though not from operational sites).

There are two principal problems with Air Force OT&E, as currently accomplished. First, operational considerations receive much less attention than desirable during Categories I and II. Second, the operational commands responsible for Category III and Operational Employment Testing lack both the personnel and the facilities required to do a first-rate job of OT&E.

Air Force test reports must proceed through several echelons of command before they reach Chief of Staff level. Furthermore, there is insufficient management and supervision from that level. Relatively recently (1965), there was established at Air Force Headquarters a Deputy Director of Test and Evaluation as part of the Directorate of Operations, Deputy Chief of Staff, Plans and Operations. This OT&E organization is too limited in its authorized scope of responsibility and too far down in the Headquarters staff to influence OT&E to the extent necessary to achieve a high degree of effectiveness. The emphasis which is placed on OT&E also varies significantly with the backgrounds and predelections of successive Directors of Operations. The function should be elevated in stature on the Air Force staff if it is to fulfill its very worthwhile objectives.

There are valuable lessons to be learned from studying the progress of OT&E in the Air Force and its predecessor elements in the Army, the Army Air Corps and the Army Air Forces. Historically, the Air Force was a pioneer in OT&E. From its origin before World

War II until its disestablishment in 1958, the independent Air Proving Ground Command (APGC) at Eglin Air Force Base, Florida, reported directly to the Chief of Staff of the Air Force on its "operational suitability tests." For years, it was considered a major Air Force asset and is generally agreed to have performed well.

In retrospect, it appears that the APGC was too successful. It grew large and expensive. With its growth, it became more cumbersome and less responsive - to the developers, to the operational commands, and to the Chief of Staff in his decision-making role. When one of the periodic budget squeezes and retrenchments occurred in 1957, the APGC was vulnerable and, much reduced in size, was relegated to being a center of the AFSC. Subordinate to the developer, it quickly lost the capability to do effective OT&E. The operational commands were unable to assume OT&E responsibilities, except on paper, and there is little doubt that some of the Air Force's problems when it entered Vietnam can be traced to failure to do certain necessary OT&E in the years immediately preceding.

Over the years since 1957, there have been attempts to re-establish the APGC, or something similar, that would be charged with performing independent OT&E and reporting results to Air Force Headquarters. The consensus within the Air Force now seems to be that the APGC was indeed highly successful at one time and probably could be again, but that it would be a luxury the Air Force could not afford in the present austere environment. In addition, there is some feeling that the operational commands are beginning to appreciate the value of comprehensive OT&E and that present programs combined with increased command emphasis have established the basis for significant OT&E improvement. Actually, there is very little tangible evidence that this belief is justified and considerable evidence that the operational commands neither understand the value of OT&E nor are particularly interested in giving it a high priority relative to other command responsibilities.

There is a lesson to be learned from this account, which apparently the Navy did learn with regard to OPTEVFOR. OPTEVFOR has never had more than a small fraction of the resources that the APGC had and has continued to operate austerely. The APGC was a well-manned, substantially funded, and expensively equipped organization. But the APGC no longer exists, and OPTEVFOR has survived to provide the Navy with the Services' only permanent independent OT&E organization.

The other major lessons to be learned are that OT&E does not flourish when it is subordinate to the developer, and that assigning the responsibility for OT&E to operational commands does not insure that OT&E will be done effectively.

4. Assessment of OT&E in the Services

It is evident that the Services differ greatly in their approach to and organization for OT&E. In the most general terms, the Navy stresses independence and reporting directly to the Chief of Service. The Army has generally subordinated OT&E to the developing organization; however, its emphasis on field experimentation represents the most innovative and potentially useful form of OT&E that now exists. The Air Force has now placed the responsibility for OT&E with the operational commands; currently these commands have neither the kinds of personnel or facilities required to do a good job of OT&E.

There is, of course, no compelling reason why the Services should have parallel OT&E organizations or should approach OT&E activities with the same philosophy and procedures. There is also the ancient management cliche that organizations do not much matter if they are staffed with good people. Unfortunately, in this instance, organization does seem to be important; and in any event good people - that is, well-qualified OT&E people - are in very short supply.

OT&E in the Services is currently in transition (perhaps most so in the Army). Some of the changes have undoubtedly been inspired by the desire to be better prepared and thus avoid some of the difficulties encountered in Vietnam. Some are certainly attributable to criticism from higher government agencies - both in and out of the Department of Defense. It is true that the pressures of Vietnam have inhibited or rendered hasty and ad hoc some important OT&E. This appears particularly true of the Air Force, whose OT&E activities are in some disarray - which is commonly attributed by Air Force people in Vietnam.

There are three major reasons for the conclusion that Service OT&E has been of uneven quality and generally much less successful than would be desirable. First, OT&E in the Services has lacked much of the independence that encourages objectivity and high level action when the results of OT&E call for it. Second, throughout the Services

there has been very little guidance from high levels as to what is desired from OT&E activities. Third, there has been too little support and encouragement of OT&E from high levels within the Services. This means that not only is more funding required to support OT&E but also that there should be the visible indication of how OT&E results are used in making important decisions.

Insofar as can be determined, the Service Secretaries have had very little influence on, or even contact with, OT&E. It would appear that this situation should change and that the Secretaries should take a keen interest in the quality of Service OT&E and the potential of OT&E for preventing costly and embarrassing failures of systems to perform in accordance with requirements. Currently, Service Secretariats are inadequately staffed to oversee Service OT&E activities; however, even a minimal effort at that level should have very beneficial effects.

E. Proposed OT&E Organization in OSD

There is a requirement for a DOD organization at higher-than-Service level, which would have broad responsibilities and authority for OT&E throughout the DOD. It is evident that there will be increased pressures on the Secretary of Defense to assure both the Congress and agencies of the Executive Branch that programs for military weapons, weapon systems, and equipment are based on valid operational requirements and that they receive continuous operational evaluation (including testing when possible and desirable) throughout the process which culminates in their introduction into the operational forces. Currently, the Secretary of Defense could not provide such assurance.

There are a variety of organizational locations for such a function within DOD. However, the OT&E function needs independence and stature if it is to perform effectively.

Consideration was given to assigning the OT&E function to the Joint Chiefs of Staff. This was judged an undesirable location. The history of JCS-sponsored test organizations has not been encouraging. There appears to be little desire within the Organization of the JCS to assume such responsibilities, and the JCS are on record as opposing the establishment within the Organization of the JCS of an agency specifically devoted to joint OT&E.

It appeared most logical that an OT&E function should be established in the Office of the Secretary of Defense. The OSD badly needs the information that can be obtained from OT&E, and it is very desirable that an organization be established within OSD to make sure that such information is obtained in usable form. Unless there is the capability within OSD to exercise reasonable and appropriate control over DOD-wide OT&E, it will be necessary to rely on evaluations and testing designed, performed, and interpreted by the individual Services. This would perpetuate an unsatisfactory situation. Although such information will often be useful, experience has demonstrated that there will be repeated occasions involving conflicting Service interests when it would be preferable for OSD to specify and control the scope and conditions of tests and evaluations. At the very least, OSD should have detailed knowledge of the effects of the conditions under which tests are conducted. Moreover, it would be highly desirable for OSD to be able to provide guidance to individual Services in the areas of OT&E, based on valid requirements for a continuing input of operational test data suitable to support comparative analyses. Thus, there are valid and significant reasons for the establishment of a comprehensive OT&E function within OSD.

In deciding exactly where, within OSD, an OT&E group should be located, several basic principles served as guidance. First, it must be separate from the developer; this rules out ODDR&E as a possible location. Second, it should have civilian leadership (albeit substantial military membership). Third, although OASD (Systems Analysis) might well prove to be the main user of the data produced, the group should not be tied to one "user" organization. Fourth, an OT&E group should have a separate budget for OT&E. Fifth, the group must be immediately responsive to the Secretary of Defense in matters relating to OT&E.

In view of all these considerations, it is recommended that the organization report directly to the Deputy Secretary of Defense. If the OSD should be substantially reorganized in the future to include (as has been suggested) a Deputy Secretary for Evaluation, the OT&E group would properly be a basic part of that element, and perhaps be headed by an Assistant Secretary.

The success of OT&E at OSD level will be highly correlated with independence, support by the Secretary of Defense, effective

leadership, and the ability, experience, and dedication of the professionals (civilian and military) assigned to it.

The OSD OT&E group would have one principal function - that is to:

-- Assume responsibility for having effective OT&E done within the DOD.

Assumption of this responsibility would be dependent upon the OT&E group having the authority required to perform it. This authority would have to include control over tangible assets - such as a budget dedicated to OT&E.

Other specific functions, which would contribute to the principal function are as follows:

-- Decide what the critical areas for OT&E are.

-- Determine the objectives and scope of required OT&E.

-- Review at an early stage of R&D the plans for conducting OT&E of major systems.

-- Monitor the conduct of OT&E.

-- Insure that OT&E results are disseminated to and used by agencies and individuals that need them.

-- Budget for OT&E.

-- Promote throughout DOD the coordination and exchange of knowledge and ideas in the field of OT&E.

-- Insure that joint OT&E is done to the extent necessary.

-- Represent OSD in contacts with external agencies relative to OT&E.

Implicit in the list of functions above is that the OSD OT&E group will not direct OT&E. Rather it will use other methods of insuring that necessary OT&E is done by the organizations where much, though probably insufficient, capability currently exists.

It is not anticipated that the OSD OT&E group would be large, but it would be expected to exert influence out of proportion to its size. That size might fall in the range of 30-40 professionals, about equally divided between civilian and military. The head of the group should be civilian; the deputy should be military. The civilian component would be comprised of career civil servants and scientists on relatively short term assignments from industry and academia. The stature of the group should be such that it can attract high-caliber civilian scientists who will regard such an assignment as an opportunity to make an important contribution to defense effectiveness. Hopefully, the group might include from time-to-time, and particularly in its early stages, individuals who have been calling attention to the lamentable lack of such a function within OSD.

Military members should come from all the Services. It is important that they be hand-picked individuals who can be productive from the beginning.

The OT&E group should have the authority and funds to contract for needed research. This would include being able to task the Weapons Systems Evaluation Group for research which that organization could do well.

The specific functions of the OT&E group would be somewhat modified if a decision were made to establish a Defense Test Agency (DTA) which would have broad authority and responsibilities for all Defense test and evaluation. A DTA would be concerned with the entire DOD test program, but would certainly emphasize operational testing, particularly mission-oriented testing which cuts across Service lines and has generally been poorly done in the past - or not done at all.

F. Facilities Available for Accomplishing OT&E

The subject of OT&E ranges has not been investigated in depth by the OT&E Task Group. However, discussions with key personnel as well as information obtained during field visits to several active facilities provided some insights into the major problems and issues involved.

The necessary characteristics of an OT&E range are just as difficult to pin down as is a precise and completely acceptable definition of OT&E. The Services have few facilities dedicated solely to OT&E. There are some exceptions, such as the fairly primitive capability just emerging at the Tactical Fighter Weapons Center, Nellis Air Force Base. Even here, however, the facility is also being used for some advanced development work by ARPA. The scope and nature of OT&E often demand instrumentation as sophisticated and precise as that required for R&D testing. As a result, instrumented OT&E has in the past often been conducted using fixed R&D facilities. In such circumstances, the nature of this type of OT&E is influenced by the capabilities of the instrumentation at hand - a high degree of precision, but with little flexibility in environment or method of application (tactics). While this type of testing can satisfy many OT&E objectives, the broader and more difficult OT&E involves the appropriate number of systems used as the operator would during combat operations - in short, mission-type tests. For this type of OT&E, little in the way of range capability exists. While such testing is ideal, it is not clear how expensive it would be (probably very expensive) or what results could be sensibly sorted out from the many complex interactions. In this respect, the Task Group has noted the proposed HAVE EDGE project of the Air Force for an integrated offensive - defensive OT&E test capability (all service requirements are to be considered). A look at what is required for mission-oriented testing can shed much needed light on this subject. At this time, not enough information exists to satisfy potential service users that such a capability will be practical or beneficial. The Air Force is currently studying this matter, with contract assistance.

It was not apparent that there is excessive duplication of range facilities/capabilities. Each Service's capabilities, as developed, fulfill legitimate and generally unique requirements. Activities were

aware of others' capabilities and had established procedures for application of use, determining priorities, and reimbursement by other users. Exchange of facilities information seems to be satisfactory to all involved. This is handled on an informal basis by occasional meetings of Range Commanders (Range Commanders Council) and its several functional committees, such as the Interdepartmental Range Instrumentation Group (IRIG). No one at any level felt this type of information exchange activity would benefit from formalization or higher level supervision.

It appears that some present ranges are becoming restricted in capability due to encroachment on airspace. At Eglin Air Force Base, for example, there is very little opportunity for other than prescribed flight routes and test patterns. At the Pacific Missile Range, Point Mugu, future range activities and planning flexibility may be extensively limited by oil exploration in the offshore areas and flight patterns of the proposed Los Angeles Intercontinental Airport near Palmdale. These are typical problems arising from non-military activities that can interfere seriously with DOD range capabilities and, in particular, OT&E types of testing.

The funding of ranges and facilities appears to be an increasingly serious problem. At the present time, there is little standardization in methods of funding or of accounting. Some activities prefer industrial funding on the basis that it forces planning and reveals inefficiencies. Others see industrial funding as leading to inflexibility and eventual loss of overall DOD service and capability, and insist that some "level-of-effort" funding is necessary to insure responsiveness. Accounting methods to determine reimbursement costs appear to vary. In most cases, it is not clear that direct costs of using ranges are sufficiently identifiable from overhead costs so that any reasonable fiscal basis for allocating costs is available.

The Task Group considers range funding and cost accounting as a problem area that needs high level attention and decisions. This could fruitfully be the subject of subsequent study effort.

No activity or individual at any level could see benefit in establishing a central range control activity within OSD or as a separate agency. The existence of the present activity in ODDR&E (Assistant Director Ranges and Range Support under the Deputy

Director, Strategic and Space Systems) was known, although Service ranges had very little direct contact with this activity. Its functions were not well known at the working level.

It is the feeling of the Task Group that a presence at OSD having cognizance of all DOD ranges could be helpful as an information coordination activity and as a monitor/advocate for national and Service range requirements. In this way, questions of unnecessary duplication could certainly be aired and resolved. An important function of such a presence at OSD would be to insure that Service requirements are exposed to higher level activities that appreciate the magnitude of overall range resource problems. To this end, the DOD activity would function as a liaison to activities external to DOD that are involved with similar activities and/or instrumentation (such as NASA, Bureau of Standards, etc.) and could act to insure that the Services were cognizant of the activities and their capabilities. In addition, the OSD function would insure that legitimate defense OT&E needs are given proper consideration relative to private and other government activity pressures regarding use of land/air space (such as Department of the Interior, FAA, oil companies, etc.). In short, a DOD level activity to act as a focal point for range matters, but not to become involved with scheduling or control, is considered necessary. The basis for this is the recognition that the overall resources and capabilities involved are very costly, and are resources that can easily become lost or degraded without such level visibility and support.

The Task Group also feels that OT&E functions at OSD level (addressed elsewhere in this report) need to be more clearly integrated with range resource monitoring activities. The current organizational arrangement with range and OT&E functions under different ODDR&E Deputies provides too much opportunity for these related functions to become captive of diverse and contrary directions of effort.

G. Funding of OT&E throughout the Department of Defense

The funding of OT&E throughout the DOD is a major unsolved problem. There is general agreement among people engaged in managing and performing OT&E that funding has been and continues to be inadequate to support much necessary OT&E.

Unquestionably the funding of OT&E is confused, both at the OSD level and within the individual Services, and neither in OSD or in any Service is there a single agency responsible for insuring that OT&E is adequately funded. In fact, and this is a serious indictment of the current system, there is no such agency that can even identify the funds that are currently being spent on OT&E.

The Air Force does not identify OT&E funding requirements separately, and they are difficult to identify in the Army and Navy budgets because funds come from several sources. Because funds "earmarked" for OT&E do not have separate status in the budget, they are often vulnerable to reprogramming actions which divert them to other purposes. When it is time to perform the planned OT&E, it is not unusual to find that funds have disappeared and that as a consequence OT&E suffers.

Funding of OT&E within the individual Services differs substantially. Some examples may be useful in illustrating the problems.

Army

The Army has a program element for RDT&E which supports TECOM's six specialized Test Boards and other facilities, and pays for most of the personnel who perform tests and provide certain test-related services. There is also a supporting Military Personnel Appropriation. OT&E funding of specific projects is budgeted for by the respective Program Managers. Project MASSTER (based at Fort Hood, Texas) which will soon be doing much of the Army's most important OT&E will be supported by separate RDT&E and Operations and Maintenance (O&M) funds. Obviously, Army funding of OT&E is fragmented. Expenditures for OT&E could probably be identified and compiled; however, such data do not now exist.

Navy

The Navy's major OT&E activity, OPTEVFOR, is supported in the budget by both RDT&E and O&M funds. Tests of specific systems are budgeted for by the system Program Manager. Once again there is no accurate estimate available of the total cost of OT&E in the Navy.

Air Force

OT&E in the Air Force is done by the operational commands with some management guidance from the Air Staff. However, the commands are not required to budget specifically for OT&E, and such testing must be paid for out of O&M funds - that is, if O&M funds are sufficient for the purpose. There is no specific provision for funding OT&E in the Air Force FY 1971 budget submission nor is there any estimate of the funds required for FY 1972-75. No current Air Force Regulation specifies who should budget for OT&E. A revised Air Force Regulation 55-31, will soon require better planning for OT&E funding, but there will be no provision for protecting or even accounting for such funds once they are included in overall O&M funds. As in the other Services, there are no available data on what is currently being spent to perform OT&E.

Clearly, the attention given to OT&E funding throughout the DOD is not consistent with the growing importance assigned to that activity at high levels of the DOD and external to the DOD. There have been recommendations within the Services, within OSD, and in such external agencies as the Bureau of the Budget that OT&E should be a separate program element in the budget. There is resistance to this, principally by comptrollers who judge, correctly, that this would reduce their flexibility to reprogram funds to meet unexpected contingencies.

It is concluded that separate program elements for OT&E must be established within the Services if OT&E is to receive the financial support required. Even then, OSD must assume the responsibility for insuring that the Services budget adequately for OT&E There is considerable evidence that the Services regard this function as less important than do authorities at higher levels of the government.

II. Requirements for Joint OT&E

Most of the OT&E which is carried on within the DOD is done by individual Services and involves the systems, equipment, and forces which each Service has, or would like to have, to carry out assigned missions. Currently there is no effective method for conducting OT&E which cuts across Service lines. This is particularly unfortunate since in most actual combat environments the Services must conduct combined operations. The interactions between Services become extremely

important during combat, and critical military missions transcend Service boundaries and responsibilities (for example, Close Air Support, Reconnaissance, Air Supply). Because of the lack of joint OT&E, it is not only very difficult to predict combat capability in advance but it is also difficult to make decisions relating to overall DOD force composition.

The Services nearly always resist evaluations of joint capabilities. The reason for such resistance is clear: such evaluations inevitably involve the roles and missions of individual Services, and these roles and missions have never been clearly defined (or at least are interpreted differently). Consequently, these unresolved differences constitute a formidable, and sometimes impenetrable, barrier to the conduct of effective joint tests and evaluations.

The history of joint OT&E in recent years presents a dreary picture. The large joint tests and exercises which have been conducted seem to have generated a maximum of disagreement (including genuine ill feeling) and a minimum of useful information. Two examples are cited very briefly here; it is believed that they are representative of the problems encountered.

1. Tests of Army Air Mobility.

In 1961-62, at the direction of the Secretary of Defense, the Army organized a study effort designed to explore ways of increasing Army air mobility. In support of this effort, the Army conducted a series of unilateral tests. The Air Force was quick to express concern about the Army's activities and convened a board of general officers and a support staff to study related capabilities and to evaluate the report of the Army to the Secretary of Defense. The Air Force board also had unilateral testing done.

It was painfully clear that from the Air Force point of view the Army's study and testing represented a threat to assigned Air Force roles and missions - particularly in the areas of Close Air Support and Air Transport. It was equally clear that the Army was indeed using the opportunity to attempt to wrest from the Air Force certain support functions to which it believed the Air Force was giving inadequate attention.

It should not be surprising that the results of the unilateral Army and Air Force testing were often markedly different, especially when the testing involved activities where assigned roles and missions appeared to overlap. The Air Force report to the Secretary of Defense took specific exception to the relevance and validity of the Army testing which was cited in the Army report.

The Army and Air Force were directed to participate in joint testing of air mobility concepts. Testing was directed by the U.S. Strike Command and consisted of two major joint exercises, GOLD FIRE I and GOLD FIRE II. These exercises involved brigade and division size Army units and appropriate Air Force supporting units. They produced very little quantitative information; and in the absence of any way to obtain quantitative measurements of performance, reliance was placed in the judgments of experienced officers. Not surprisingly, there was remarkably little agreement between the Services.

2. Joint Task Force Two

The second example of joint testing and evaluation involves Joint Task Force Two, which was created in 1964 and disestablished in 1968. The purpose of JTF-2 was to fill troublesome gaps in basic knowledge about low-altitude penetration and operations of tactical and strategic aircraft. The lack of this information had handicapped both the R&D community and high level decision-makers responsible for force composition and operational contingency plans.

JTF-2 involved a minimum of inter-Service rivalry; for the most part, roles and missions were not believed to be in jeopardy. Nevertheless, the testing activities of JTF-2 encountered increasing resistance from all the Services, which was undoubtedly intensified by the demands of Vietnam air operations. The Services were required to support JTF-2 with resources of personnel and aircraft at a time when they could ill afford either. It is also fair to say that the Services could not in general see how the testing done by JTF-2 was benefiting them. Furthermore, the Organization of the JCS did not regard itself as a user of the information produced by JTF-2. As a result, JTF-2 was almost from the beginning on the defensive, and eventually perished because it lacked a sufficiently powerful sponsor. OASD (Systems Analysis) and ODDR&E

should have been powerful advocates of JTF-2. In fact, they did not support it when it needed supporting and acquiesced in its demise (while unofficially, "off-the-record," regretting it).

In retrospect, it appears that for most of its existence JTF-2 was in an organizing and learning phase. It is certain that it was handicapped by the constant necessity to do battle for resources and to justify its existence. The problems it faced were difficult, mistakes were inevitably made, but much was learned about organizing to conduct complex operational tests. It is probable that JTF-2 was disestablished at a point when it was about to produce information that was needed and that we still need and do not have any way of obtaining. When disestablished, it was probably also approaching the capability of taking on other joint testing which very badly needs doing. It is particularly unfortunate for the future of OT&E that JTF-2 was abandoned when much-needed instrumentation and analytical tools were only partly developed. For the most part, this investment in the future was lost. It is arguable that the dissolution of a capability which had cost on the order of 80 million dollars was very short sighted.

3. Lessons Learned from Past Efforts to Conduct Joint OT&E.

The principal lessons to be learned from the generally unproductive efforts to conduct joint OT&E, of which the above are examples, are the following:

a. They will be resisted by the Services whenever they involve roles and missions - and the joint OT&E with the greatest potential will involve roles and missions.

b. The Services are unsympathetic to expending resources for basic information which they cannot see will help them in the short term.

c. If joint OT&E is to be productive, it must be directed by a civilian sponsor at OSD level (not JCS!), sufficiently powerful to insure that the objectives of the OT&E are realized.

Currently, we are left with ad hoc arrangements as the only way of organizing for and conducting joint OT&E. This has assured that such joint OT&E as is done will be largely unproductive and of little use to decision-makers at OSD level.

4. Value of Large-Scale Exercises for Joint Evaluations.

There is a long history of large-scale exercises and maneuvers more or less routinely conducted by elements of the DOD. Sometimes they have involved only one Service, but more often two or more Services have participated. Although there have been very few such undertakings during the past several years owing to the demands of Vietnam, it is highly probable that they will be conducted again in the future as resources become available.

It would be very desirable to use these large-scale exercises and maneuvers both to assist with joint evaluations and to provide basic data on joint operational capabilities. They provide an excellent opportunity to evaluate systems and tactics in the nearest peacetime approximation to a realistic combat environment. Frequently problems (for example, electronic interference and conflicts in communications requirements) which do not occur, or at least are not noticed, in individual system testing are identified in such exercises. In addition, when it is possible to derive assessments of system capabilities from large-scale exercises, they are generally closer to actual combat performance than are estimates based on individual system evaluation.

In the past, such major exercises have produced very little of what might be termed "hard data" - that is, valid, quantitative information which could be used to support objective evaluations of capabilities. On the other hand, most such exercises have produced qualitative judgments by observers selected for their relevant experience. Thus, evaluations of large joint exercises customarily are afflicted by the same problems described in the earlier example of joint Army-Air Force testing. It is certain that joint issues can rarely if ever be resolved by military judgment. Thus, there is a great premium on any methods for obtaining quantitative data which are subject to scientific verification.

Unfortunately there is a natural conflict between evaluation, and its inherent data and information collection, and the principal purposes of most large-scale exercises: training, system integration, and identification of problem areas. Data collection often interferes with normal operations and reduces the degree of realism, and since data collection is normally a low-priority objective, attempts to obtain information suitable to support evaluations often meet with little success.

There is an urgent need to exploit such large-scale exercises as sources of quantitative information. It will require high-level support to establish the obtaining of quantitative data as a high-priority objective of at least some exercises - or some phases of exercises. Operations and systems analysts must become involved in the design and conduct of exercises so they can devise methods of obtaining certain much-needed quantitative information with the least possible degradation to operational realism and to the time-honored and important goals of such exercises.

It is anticipated that an OT&E group in the OSD would take the initiative in making such large and costly exercises produce data which would be very useful at that level.

I. OT&E in Industry

The OT&E Task Group investigated similarities and differences between the way OT&E is done in the DOD and in some major U.S. industries. The automotive industry was represented by the General Motors Corporation and the airlines by Pan American and American.

The organization of General Motors is in some important ways remarkably analogous to the DOD. The individual automotive divisions can be compared with the military departments, and the corporate headquarters performs functions similar to the OSD. Each automotive division conducts its own research, most often internally but at times using facilities provided by the corporation. The corporation provides overall policy guidance and itself performs research in areas of concern to several divisions, of current interest to no division, or so important that corporate interest is required.

The major difference between the automotive industry and the DOD is that the former is a producer, interested primarily in profit, while the latter is a user, interested primarily in performance. This different orientation bears heavily on the amount of risk judged acceptable. Automotive research and testing is directed mainly at product improvement, with the assumption that competitors are constrained to act in accordance with the same general philosophy. Military research and testing is directed toward attaining large increases in operational capabilities which often challenge the state-of-the-art.

Most OT&E in the automotive industry is in connection with production rather than research. There is considerable emphasis, apparently increasing, on OT&E of total automotive systems to determine which components require improvement. Research testing (mostly non-operational in nature) is generally performed on individual components rather than on the complete system.

Only a limited amount of system testing is conducted prior to entering actual production since an automobile is essentially a combination of components with well understood characteristics.

Pre-production testing is done to check the assembly and insure that no mistakes were made in the engineering. Most of the actual operational testing and evaluation is conducted on new production, primarily for quality control or product assurance. In fact, all of the General Motors proving grounds are administered by the Product Assurance Division. Each new model is tested extensively by both the producing division and the corporate staff to insure that it meets the specified requirements. These tests are conducted in conditions which approximate normal usage to the extent possible, and use many average drivers in addition to trained test drivers. In addition to product assurance, these extensive tests help to identify areas of potential product improvement for future models in order to increase customer acceptance of the product.

Recent government regulations are beginning to force the automotive industry farther into fields of new development which will involve very extensive testing. Various safety standards have led to testing and evaluation designed to determine the best and most economical methods for compliance. They have also led to increased operational testing of the effects of collisions in order to determine overall vehicle safety. Emphasis on anti-pollution measures is accelerating research in changed methods of propulsion which will require extensive and continual testing during the development process.

The automobile industry could probably learn much from the DOD about operational testing and evaluation. In particular, the DOD appears to be much more advanced in applying the methodologies of operations research/systems analysis to problem solving. General Motors is currently increasing its capabilities in this area.

There are two aspects of OT&E in the automotive industry which should be more emphasized in the DOD. Corporate headquarters is very active in providing guidance to the automotive divisions and itself performs relevant OT&E on their behalf. Also, the automotive industry is very active in OT&E designed to determine with great precision the characteristics and capabilities of current systems.

The requirements for and use of OT&E by the airlines parallel those of the DOD much more closely than do those of the automotive industry. The airlines, similar to the DOD, have changing requirements to counter new threats. For the airlines the threat is competition, which to them is as real a threat as is the enemy to the military. The airlines are profit motivated, and OT&E is primarily oriented towards increasing customer acceptance and efficiency of operation.

In a very real sense, OT&E is continuous on all flights. Extensive data are collected and maintained on all aspects of operations, partly because of the safety requirements imposed by the FAA. These data are used by the airlines to locate deficiencies, improve operating and maintenance practices, and determine future requirements for product improvement.

In addition to evaluation of current operations, OT&E plays an important role in the procurement of new systems or equipment. In general, there are three separate methods of procurement in which OT&E has a major role.

First, are low-risk systems which extend current capabilities but do not challenge the state-of-the-art; these may be larger or smaller aircraft of essentially the same design as those now in use. Such aircraft are purchased prior to the first production. In this case, OT&E is used to confirm that the specifications and performance guarantees are achieved and to determine optimum operating and maintenance practices.

Second, are systems which represent radical advances for which there is no reliable precedent, such as the Supersonic Transport. In such instances, the airlines will make no irrevocable commitment for purchase until prototypes have been produced and the practical application of the concept has been successfully demonstrated by operational testing.

Finally, systems and equipment which have potential for large-scale installation, such as new navigation systems or baggage handling equipment, will be procured for limited installation and test. This pilot operation will provide information to determine actual suitability, including customer acceptance of the system, and to determine features of the system which require improvement prior to final adoption and large-scale installation.

Although there are some similarities of the OT&E described to that which occurs in the DOD, there is much less emphasis in the latter on the recording of data during routine operations. This means that OT&E generally requires special tests. In addition, the DOD feels compelled to take risks in introducing new systems which airlines are not permitted to take. In general, OT&E within the DOD has much less opportunity to influence early production systems.

APPENDIX A

OPERATIONAL TESTING AND EVALUATION

IN THE OFFICE OF THE SECRETARY OF DEFENSE

AND THE

JOINT CHIEFS OF STAFF

GENERAL DISCUSSION OF OT&E ACTIVITY ABOVE SERVICE LEVEL

In identifying and evaluating the effectiveness of OT&E at OSD and JCS levels, an attempt was made to assess its contributions in the following aspects:

1. Obtaining information to assist in determing requirements for new systems and materiel.

2. Providing inputs to data bases needed in planning future forces and making choices among alternative future systems.

3. Developing tactics and techniques for employing systems already in the inventory.

4. Evaluating the operational suitability of new systems, as the culmination of the RDT&E process.

There are several staff organizations above Service level that are involved in one or more of these aspects of OT&E. However, their effort is fragmented, and none of them has the responsibility of managing or monitoring OT&E as a whole. There is no single focal point for information on policies, procedures, organizations, and facilities for conducting and reporting on OT&E within the DOD.

One reason why OT&E activities in OSD and JCS are so fragmented is that there is no consensus that a focal point at that level is required. Particularly in JCS there is considerable belief that such matters are properly left to the individual Services, and that it is possible and desirable to rely on the Services cooperating and freely exchanging information obtained from Service OT&E. Although there is much such cooperation and exchange, it would be naive in the extreme to rely on it to provide OT&E data for high level decisions which involve Service roles and missions.

There is no effective higher-than-Service level organization to take a broader point of view towards OT&E than is possible at Service level and assume the responsibility for doing or having done OT&E needed to assist with important decisions which may conflict with the institutional interests of one or more of the Services.

For convenience OT&E at OSD and JCS level can be divided into two categories: strategic missile systems and non-nuclear systems.

Generally, OSD and JCS level supervision of OT&E of strategic missile systems is judged to be adequate. The Deputy Director (Strategic and Space Systems), ODDR&E, exerts considerable influence on OT&E activities and facilities for evaluating overall strategic missile performance. In addition, this is an area where the Weapons Systems Evaluation Group has made, and is continuing to make, relevant and useful studies.

In marked contrast, supervision of OT&E of non-nuclear systems by higher-than-Service agencies is manifestly fragmented, incomplete and largely ineffective.

The Assistant Secretary (Systems Analysis) has been seriously handicapped by lack of OT&E data on non-nuclear systems. In particular, OASD(SA) has not been able to obtain data which reliably indicate the capabilities and limitations of such systems now in the hands of operational forces. Without such base-line data, it has been extremely difficult to evaluate the worth of proposed follow-on systems. OASD(SA) would be a major consumer of valid OT&E data if such data were available.

The Assistant Director (OT&E), ODDR&E, appears to have the principal responsibility for OSD's interests in and supervision of OT&E throughout the DOD. This directorate has been generally ineffective for the four years it has existed. This is partly attributable to woefully inadequate manning. The most important reason for its lack of influence, however, is its location. An OT&E organization should not be subordinate to the developer. Even within the developing organization (ODDR&E), the Assistant Director (OT&E) is too far removed from the decision-making level. There is very little relationship between Assistant Director (OT&E) and Service OT&E agencies. Often the latter were not even aware that such an organization existed within the OSD.

Two other OSD offices monitor and, in some respects, supervise aspects of non-nuclear OT&E, but their functions duplicate or overlap those assigned to Assistant Director (OT&E). These offices are the Assistant Director (Chemical Technology), ODDR&E, who provides OSD

attention to joint OT&E of chemical and biological weapons, and the Defense Communications Planning Group, which directs both the testing and operational employment of remote sensors and anti-infiltration munitions.

It was disturbing to discover that the JCS has no focal point for OT&E and conducts no continuing evaluation of what OT&E is required to support joint planning. This is a shortcoming that needs to be remedied. It is evident that the JCS deals with OT&E on an ad hoc basis as a matter of policy, and the history of such JCS initiated ad hoc efforts indicates that they have often been very unproductive.

In many instances, force structure and war plans are based on estimates of capability and readiness that have never been operationally validated. DDR&E has stressed, without much success, the need for the Military Departments and the Joint Staff to identify areas where quantification through operational testing would be particularly fruitful. DDR&E has actually solicited proposals for such tests, but there has been no significant response. *

The Weapons Systems Evaluation Group currently directs no operational testing activities and has no responsibility in this area. WSEG undertakes operational evaluations and analysis in response to directives from both ODDR&E and the JCS, but it has no continuing responsibility in this respect. WSEG almost certainly has a greater capability for OT&E than is being exploited, and this capability could be increased if the decision were made to do so. Assigning WSEG more OT&E tasks should receive serious consideration.

* DDR&E Memorandum for Secretaries of Military Departments and Chairman, JCS, Subject: Operational Testing to Evaluate Capability and Readiness, dated 13 January 1967 (Attached as Inclosure 5).

SPECIFIC HIGHER-THAN-SERVICE OT&E ACTIVITIES

This is a description of OT&E in the OSD and the JCS, accompanied by identification of some problem areas.

Office of the Secretary of Defense

Assistant Director (OT&E), Office of the Director, Defense Research and Engineering. The Assistant Director (OT&E) is the only OSD office specifically charged with OT&E functions. This office was established in March 1966, with functions and responsibilities pertaining to the testing and evaluation of weapon systems or materiels in service use or in the operational phases of testing and evaluation.[1/] It was and is oriented chiefly toward programs in the area of tactical warfare.

The establishment of this office reflected the feeling of then Deputy Secretary Cyrus Vance and the DDR&E, Dr. Foster, that more attention was needed at the OSD level to matters of testing and evaluation as they related to the DOD research and development effort. There was the expressed intent to regularize the monitorship of the interaction between R&D and any major weapon system throughout its life.[2, 3, 4/]

1/ DDR&E Office Memorandum No. 4-66, Subject: Organizational Changes and Appointment of Personnel in ODDR&E (Attached as Inclosure 1).

2/ Secretary of Defense Memorandum for Service Secretaries (and others), Subject: Creation of Office for Operational Test and Evaluation, dated 7 July 1966 (Attached as Inclosure 2).

3/ DDR&E Memorandum, Subject: Office for Test and Evaluation, ODDR&E, dated July 20, 1966 (Attached as Inclosure 3).

4/ DDR&E Memorandum, Subject: Functions of the Office for Operational Test and Evaluation, ODDR&E, dated September 21, 1966 (Attached as Inclosure 4).

Unfortunately, the successive functional statements of the Assistant Director (OT&E) and other OSD actions reflect a narrowing of responsibilities from those apparently originally intended.

Current functions are as follows:*

> Applies OSD level attention to matters of test and evaluation as they relate to the management of our research and development effort.
>
> Ensures that facts exposed by operational test and evaluation in the Services and performance data derived from military employment are broadly disseminated and exploited to speed research and development, to improve defense materiel and weapons systems capabilities, and to assist related Defense planning.
>
> Oversees for adequacy and timeliness the operational test and evaluation efforts of the Services; observes military exercises, maneuvers and combat evaluations organized to test materiel in the operational environment; and investigates reported deficiencies in operational weapons systems, assisting in remedial actions.
>
> Performs ODDR&E staff review and ensures appropriate action on program elements in the RDT&E Program and Budget which apply to Operational Test and Evaluation.

From the beginning the Assistant Director (OT&E) functions have applied primarily to non-nuclear OT&E, and now they also exclude the joint chemical/biological operational test area. The current functions also no longer include another important area acting as focal point within OSD for information as to policies, procedures, organizations and facilities for operational tests and evaluations of materiel and systems in the DOD.

A further restriction on the scope of effort has been the focusing on weapon systems or materiel in service use or operational phases of testing and evaluation as contrasted to technical or contractor tests occurring during development.

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*ODDR&E Office Order No. 22 (Rev. 1), Subject: Functional Statements, dated 4 September 1968, p. 8.

The latter policy was informally modified in June 1969 to deemphasize earlier involvement with post-production, user, operational performance evaluations and to extend staff interest back into developmental testing. However, there has not yet been a change in formal functional statements, nor has there been action by DDR&E on a number of memos from the Assistant Director (OT&E) pertaining to the subject.

The Assistant Director (OT&E) is manned by five officers and two clerical personnel. These officers do not appear to have been selected for exceptional experience and ability in operational test and evaluation. Even if they had such qualifications, it is difficult to see how such a small office could be effective in supervising the broad OT&E area on behalf of the OSD. Further, their placement in DDR&E subordinates them to the developer and in effect, has the developer evaluating his own product.

None of the many Service personnel interviewed by the OT&E Task Group indicated receiving any assistance or guidance from the Office of the Assistant Director (OT&E).

Assistant Director (Chemical Technology) of ODDR&E*. On 21 February 1968, the Assistant Director (Chemical Technology) assumed cognizance over the Deseret Test Center Joint Chemical/Biological Operational Test and Evaluation activities from the Assistant Director (OT&E). This change occurred when the Army Dugway Proving Ground was merged with the Deseret Test Center. The portion of the current Deseret Test Center program pertaining to joint offensive weapon OT&E faces an uncertain future in view of the Presidential moratorium in this area.

Deputy Director (Strategic and Space Systems). Test and evaluation of nuclear weapon systems, less live warhead testing in the atmosphere, is under the cognizance of the Deputy Director (Strategic and Space Systems) and his Assistant Directors (Strategic Weapons) and (Defensive Systems).

The OT&E of strategic missile systems appears to present a special situation which should be treated separately and differently from other OT&E.

*ODDR&E Office Order No. 22 (Rev. 1), Subject: Functional Statements, dated 4 September 1968, p. 11. (Extract attached as Inclosure 6).

Because of the extreme cost and complexity of strategic missile systems and of the instrumentation required to determine performance, a separate independent OT&E capability would be too c tly in both dollars and trained personnel.

The Assistant Secretary (Systems Analysis). The Assistant Secretary (Systems Analysis) prepares Draft Presidential Memoranda on the General Purpose, Strategic, and other military forces; prepares force structure comparative analyses, including cost estimates of alternative defense programs; and reviews Service budget requests for new weapon systems for the Secretary of Defense. The Assistant Secretary (Systems Analysis) has been hampered in its analyses by the lack of base-line data available on performance of current systems and subsystems.

Joint Chiefs of Staff

There is no Joint Staff agency specifically charged with OT&E responsibility, and it was the belief of several Joint Staff general officers interviewed that there should not be such a function formally established within the Organization of the Joint Chiefs of Staff.

The JCS have from time to time reacted to matters involving OT&E deficiencies by either charging the Weapons Systems Evaluation Group with creating an ad hoc committee to examine the problem or perform a test and evaluation, or by recommending creation of special Joint Task Forces. Examples of WSEG activities are the WEXVAL exercises of the late 1950's, a study of OT&E of strategic ballistic missiles, actual operational testing of the M-16 rifle in Panama, and an on-going study of OT&E of air-to-air missiles. Examples of joint task forces are Joint Task Force Two and Joint Task Force Eight.

Generally these ad hoc committees and task forces were reactive, were organized long after a major problem was recognized, and took considerable time to get started. It has been observed that joint task forces tend to disappear under later budget and manpower pressures, sometimes without major accomplishments.

Joint Task Force Two, established in 1964 to examine low level penetration problems, was disestablished in 1968 with very little to show for approximately $80 million dollars expended.

The Deseret Test Center, established to conduct joint chemical biological operational testing, has been another costly venture and now faces an uncertain future.

Joint Task Force Eight was hurriedly created in 1961 to enable resumption of atmospheric nuclear testing. It will be disestablished in July 1970.

Weapons Systems Evaluation Group

(WSEG is actually assigned to and funded by ODDR&E: however, it receives about 75% of its tasks from the JCS)

History. In December 1948, Secretary of Defense Forrestal directed establishment of the Weapons Systems Evaluation Group, reporting administratively to the Research and Development Board and providing guidance to both the RDB and to JCS.

WSEG was to apply techniques of "Operations Research" to the evaluation of the relative military worth of different weapon systems. The term "Operations Research" as used here is the same as operations analysis - a form of evaluation that deals with weapon systems, tactical doctrine, methods of warfare and the like.

It had been understood when WSEG was formed that it would be placed directly under the JCS at the end of one year. However, this transfer was opposed later because of a feeling that it must be free and independent to express its opinions without fear or favor and able to undertake studies it deemed important.

From 1954 until 1962, the WSEG mission was as follows:

1. To provide the Department of Defense with comprehensive, objective, and independent analyses and evaluations under projected conditions of war, which will include but will not necessarily be confined to:

a. Present and future weapon systems.

b. The influence of present and future weapon systems upon strategy, organization, and tactics.

c. The comparative effectiveness and costs of weapon systems.

2. To make available to the Department of Defense timely advice and assistance to aid decisions in the allocation of resources for development of the most effective combination of weapon systems.

WSEG also had the responsibility for undertaking such studies as the Group itself might decide to initiate on the grounds of reference to current and projected work of the Group.

The Institute for Defense Analyses (IDA) was created in 1956 to provide direct contract support to WSEG.

Current Status. The Weapons Systems Evaluation Group is a Department of Defense organization under the administrative direction of the Director of Defense Research and Engineering within the Office of the Secretary of Defense (OSD).

Since 1962, WSEG has been charged with conducting operational analyses and evaluations for the Joint Chiefs of Staff (JCS) and the Director of Defense Research and Engineering (DDR&E), and other elements of the Office of the Secretary of Defense as authorized by the Secretary of Defense; and with participation in and supervision of such WSEG study contracts with civilian or other government agencies as may be required in discharge of its mission.

WSEG is a composite organization directed by a Lieutenant General or Vice Admiral and staffed by about 50 senior officers drawn from the several Services. Civilian analysts for the projects come from the contractor (principally IDA) with whom WSEG contracts for a given project.

WSEG has recently conducted one Operational Test and Evaluation -- that of the M-16 rifle in Panama in 1967/1968. For the most part, its efforts have consisted of operational analyses and operational evaluations using as inputs data obtained from the Services and their test agencies. WSEG has not participated in the Service operational tests of new weapon systems at the stage where production might be affected by the findings.

WSEG evaluations today are reactive and generally take several months to organize after a major problem prompts the JCS or an OSD office to request a study. The present WSEG mission appears on paper to be considerably reduced in scope and initiate from what it was in the 1950's.

OFFICE OF DIRECTOR OF DEFENSE RESEARCH & ENGINEERING
WASHINGTON, D. C.

March 7, 1966

OFFICE MEMORANDUM NO. 4-66

SUBJECT. Organizational Changes and Appointment of Personnel in ODDR&E

1. Effective 21 February 1966, a new Deputy Directorate for Chemistry and Materials was established in ODDR&E. The Offices of the Assistant Director for Materials and for Chemical Technology were reassigned from the Deputy Director (Research and Technology) to the new Deputy Directorate. Dr. Donald M. MacArthur was assigned as Deputy Director (Chemistry and Materials) on 21 February 1966.

2. Effective 7 March 1966, the position of Assistant Director (Administration and Management) is abolished and the Office of Assistant Director (Operational Test and Evaluation) is established, with Rear Admiral Vincent P. de Poix, USN, assigned as the Assistant Director. The new office will function under the Deputy Director (Administration and Management). Functions and responsibilities of the new office will pertain to test and evaluation of weapons systems or materials in service use or in the operational phases of test and evaluation as contrasted to technical or contractor test, and will be oriented chiefly toward programs in the area of tactical warfare.

3. Effective 7 March 1966, Mr. Edgar G. Shelor, Jr., is designated Assistant Director (Communications and Electronics).

4. Effective 21 March 1966, the office of Assistant Director (Plans and Policy) will be terminated. Functions of that office pertaining to planning, program objectives, program guidance and program analysis will be transferred to the Office of Program Review and Coordination. Functions pertaining to communications with industry and industry groups (guidelines, briefings, etc.) will be transferred to the office of the Assistant Director (Engineering Management).

5. Effective 21 March 1966, Mr. Paul Sturm, Assistant Director (Plans and Policy) is redesignated as Special Assistant (Plans and Policy) reporting to the Deputy Director (Administration and Management).

Wm. J. Ely
Lt. General, USA
Deputy Director
(Administration & Management)

INCLOSURE 1

THE SECRETARY OF DEFENSE
WASHINGTON

7 JUL 1966

MEMORANDUM FOR Secretaries of the Military Departments
Chairman of the Joint Chiefs of Staff
Director of Defense Research and Engineering
Assistant Secretaries of Defense
Assistants to the Secretary of Defense
Directors of the Defense Agencies

SUBJECT: Creation of Office for Operational Test and Evaluation

A new office for Operational Test and Evaluation has recently been formed within the Office of the Director of Defense Research and Engineering. The establishment of this office, under an Assistant Director, reflects my feeling and that of the Director of Defense Research and Engineering that more attention is needed at the OSD level to matters of test and evaluation as they relate to our research and development effort.

While it is well recognized that there is almost invariably an involvement between research and development and any major weapon system throughout its life, the monitorship of this interaction has not before been regularized within OSD. As implied in the name, it is intended that the activities of the new office will be devoted primarily to matters of test and evaluation as they relate to the user rather than the developer: that is, with phases of the life of systems or equipment subsequent to contractor or technical test and evaluation.

DEPUTY

OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
Washington, D. C.

July 20, 1966

MEMORANDUM FOR DEPUTY DIRECTORS
ASSISTANT DIRECTORS
OFFICE DIRECTORS

SUBJECT: Office for Test and Evaluation, ODDRE

REFERENCES: a) ODDRE Office Memo No. 4-66, March 7, 1966

b) Memo from Deputy SECDEF, Multi-addressees, subject: Creation of Office for Operational Test and Evaluation, July 7, 1966

As stated in the above two references, the office for Operational Test and Evaluation in ODDRE was formed to give more attention at OSD level to matters of test and evaluation as they relate to our research and development effort. More specifically, it is intended that the activities of this office be devoted primarily to test and evaluation matters relating directly to the user rather than the developer. The functions and responsibilities of this office then, will pertain to weapon systems or materials in service use or operational phases of test and evaluation as contrasted to technical or contractor tests occurring during development. Thus, other ODDRE offices will continue to exercise their responsibilities for developmental tests.

Experience has shown that in test and evaluation frequently there is no clear-cut line separating the area of concern of the user from that of the developer. This absence of definition makes it essential that the ODDRE offices concerned maintain the closest coordination with the Office of Operational Test and Evaluation to insure the integrity of the test and evaluation effort.

An understanding of the functions of the new office for Operational Test and Evaluation will assist, among other things, such coordination. For this reason these functions as presently visualized are listed below:

1. Investigates reported deficiencies in weapons systems which are deployed or have been accepted for service use, and insures that appropriate action is taken to diagnose problems and identify R&D action needed.

2. Monitors certain major field or fleet exercises or maneuvers of the Services for the appearance of operational or technical problems which require some RDT&E action for correction.

3. Collaborates with the Services as needed in devising tests to determine actual combat readiness of weapons systems which may come under question.

4. Reviews plans for and results of the operational tests and evaluations conducted by the Services on major new weapons systems to determine the adequacy of these systems for operational employment.

5. Reviews the programs of the Services for research and development on major items of training equipment and devices intended to insure combat readiness of our operational forces.

6. Collaborates with the Services to insure the suitability of material needed to support operational training in major weapons systems.

7. Functions as ODDRE action office in connection with directing the plans and activities of Joint Task Force Two and, as assigned, any other joint task force or project which has a mission in operational test and evaluation.

9. Acts as the focal point within OSD of information pertaining to policies, procedures, organizations and facilities for operational test and evaluation of material and systems in the Department of Defense, primarily those concerned with tactical warfare. Initiates such policy or guidance as may be required in connection with the above.

WM. J. ELY
Lt. General, U. S. Army
Deputy Director
Administration & Management

OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D. C. 20301

September 21, 1966

MEMORANDUM FOR DEPUTY DIRECTORS
ASSISTANT DIRECTORS
OFFICE DIRECTORS

SUBJECT: Functions of the Office for Operational Test and Evaluation, ODDR&E

REFERENCES:
a) ODDR&E Office Memo No. 4-66, dated March 7, 1966, subj: Organizational Changes and Appointment of Personnel in ODDR&E

b) Memo from Deputy SECDEF to multiple addressees, dated July 7, 1966, subj: Creation

c) Memo from DD(A&M), ODDR&E, to above addressees, dated July 20, 1966, subj: Office for Test and Evaluation, ODDR&E

The Office of Operational Test and Evaluation has been established to assist the Director of Defense Research and Engineering to apply the results of operational test and evaluation to the R&D process. Immediate objectives of this application are to orient R&D toward equipment deficiencies or new requirements found by test and evaluation or exposed by service experience; to add speed and precision to the R&D process where the results of operational test and evaluation may be exploited; and to identify for action those fixes and improvements that significantly enhance capability or extend service life of weapons, weapons systems and Defense materiel. A longer range objective is the study of test and evaluation data for the purpose of identifying technical criteria that should be applied in force structure planning. Related also is the function of coordinating the development and use of Service test and evaluation facilities, primarily those concerned with tactical warfare, to enhance efficiency in the use of resources and time.

It is intended that the activities of this office be devoted primarily to test and evaluation matters relating directly to the user rather than the developer. The functions and responsibilities of this office will therefore pertain to weapon systems or materiel in service use or operational phases of test and evaluation as contrasted to technical or contractor tests occurring during development. Other ODDR&E offices will continue to exercise their responsibilities for developmental tests.

Experience has shown that in test and evaluation frequently there is no clear-cut line separating the area of concern of the user from that of the developer. This absence of definition makes it essential that the ODDR&E offices concerned maintain the closest coordination with the Office of Operational Test and Evaluation to insure the integrity of the test and evaluation effort.

Reference c), now superseded by this memorandu, advised addressees of functions as then visualized for the office for Operational Test and Evaluation, ODDR&E. Although final details will continue to be developed, the functions currently assigned are as follows:

1. Investigates reported deficiencies in weapons systems already deployed or accepted for service use, and insures appropriate action is taken to diagnose and apply remedial research and development.

2. Monitors selected major joint or Service field or fleet exercises or maneuvers to identify operational or technical problems requiring RDT&E corrective action.

3. Collaborates with the Services as needed in devising tests to assure combat readiness of or to identify deficiencies in weapons systems.

4. Reviews plans for and results of operational tests and equipment where such tests and evaluations are designed to determine the adequacy of the tested items for operational use.

5. In coordination with other ODDR&E offices, reviews for completeness, adequacy and timeliness the research and development programs of the Services on major items of equipment and training devices intended to insure combat readiness of operational forces.

6. Collaborates with the Services to insure the suitability of material needed to support operational training in major weapons systems.

7. Serves as ODDR&E action office on matters pertaining to Joint Task Force Two and, as assigned, other joint task forces or projects with a mission of operational test and evaluation.

8. Performs ODDR&E staff review and takes appropriate action on program elements in the RDT&E Program and Budget which apply to operational test and evaluation.

9. Acts as the focal point within OSD for information as to policies, procedures, organizations and facilities for operational test and evaluations of materiel and systems in the DOD.

10. Initiates policy or guidance as required to promote coordination among the Services in use and development of instrumentation, equipment, facilities and methodologies for operational test and evaluation.

MARVIN L. McNICKLE
Lt. General, U. S. Air Force
Deputy Director (Administration,
Evaluation and Management)

OFFICE OF THE DIRECTOR OF DEFENSE RESEARCH AND ENGINEERING
WASHINGTON, D. C. 20301

13 JAN 1967

MEMORANDUM FOR: Secretaries of the Military Departments
Chairman of the Joint Chiefs of Staff

SUBJECT: Operational Testing to evaluate capability and readiness

Our Force Structure and War Plans are, in many cases, based on estimates of capability and readin[illegible]t have never been operationally validated. The studies which grea[illegible]nfluence our Force Level decisions frequently contain a suc[illegible]sion of performance estimates, the variation of which could significantly change our opinions. I am particularly concerned that the results we obtain during acceptance testing at the end of the materiel Development phase are more optimistic than we can expect when the materiel is in the hands of normal Field Forces.

Modern instrumentation and computer technology offer tools of prime utility for measuring our real operational capability. They could perform invaluable service in this role if there existed a systematic program of operational tests aimed at establishing the performance factors of our equipment in the hands of the actual user. With these factors for inputs, planning then can be based on scientific measurements rather than estimates.

I is desired therefore that the Departments and the Joint Staff examine the projected Force Structure and planning to identify areas where quantification through operational testing would be particularly fruitful fruitful. I would welcome proposals for initial candidate tests for this program in the near future so that we can commence to eliminate uncertainties at the base of our planning.

John S. Foster, Jr.

INCLOSURE 5

(Extract from ODDR&E Office Order No. 22 (Revision 1), Subject: Functional Statements, dated 4 September 1968, p. 14)

ASSISTANT DIRECTOR (CHEMICAL TECHNOLOGY)

Has cognizance of the DOD RDT&E programs in the following areas:

a. Chemical warfare
b. Biological warfare
c. Materials technology
d. Life sciences (except Social and Behavioral Sciences)
e. Medical sciences
f. Bioastronautics

Reviews the Service submissions for these programs for budget and apportionment purposes to assure that they:

a. have priority consistent with military needs and requirements,
b. represent reasonable and realistic technical approaches, and
c. do not contain needless or wasteful duplication of effort.

Monitors the Service programs during the year of execution to achieve rapid exploitation of technological opportunity, cancellation of efforts which prove less desirable than originally thought and such other managerial actions as may be done to maximize return on R&D investment.

APPENDIX B

OT&E IN THE ARMY

HISTORY OF ARMY TESTING

The heart of the Army Operational Test and Evaluation (OT&E), prior to quantity production of weapon systems has historically been located at the Six Service Test Boards which are currently part of the U.S. Army Test and Evaluation Command (TECOM), a major subordinate command of the U.S. Army Materiel Command (AMC), (See Inclosure 1). Prior to the establishment of AMC in mid 1962, the Technical Services were responsible for engineering tests, which determined the technical performance and safety acceptability under controlled test conditions, and in many cases had established separate facilities for this mission. The Service Test Boards were assigned to the U.S. Army Continental Army Command (CONARC) and conducted their OT&E in a manner similar to current testing under TECOM to determine the overall suitability of the item of equipment for operational use within the Army. The establishment of AMC consolidated in TECOM the independent test facilities of the Technical Services and the CONARC boards. At the time TECOM was formed it was felt that both the developer/producer and the user had an interest and a need for the results of engineering tests and service tests. The user's, as compared to the developer/producer's interest in service test results, was considered to be predominant. Consolidation of the responsibility for both engineering and service tests within TECOM was expected to result in a more efficient and responsive organization which could provide a basis for recommending possible trade-offs between technical capability and operational requirements. In 1962, the U.S. Army Combat Developments Command (CDC) was established which provided an organization with overall responsibility for representing the user and a means for achieving better user field tests, experiments and evaluations.

During the period 1965-67, the Army conducted a very extensive in-depth review of the test and evaluation process as a result of the study of Army Test and Evaluation (SATE) and the DA Board of Inquiry on the Army Logistics System (Brown Board). Both SATE and the Brown Board made careful distinction between the test and evaluation function, or more specifically between materiel testing and operational evaluation. Materiel testing was considered to be a process by which data is accumulated to serve as a basis for assessing the degree to which a materiel item or system meets or fails to meet the technical

or performance specifications toward which it was designed and built. Operational evaluation was felt to be a subjective determination of the utility, i.e., the military operational value to the user, of the item or system when measured against the threat analysis and future requirements of concept, doctrine, environment, organization, skills, supportability and obsolescence. Evaluation was considered to be broad in scope and included testing as one of its elements.

Using the above definitions of materiel testing and operational evaluation, the SATE recommended eight improvement actions, of which six were approved by the Chief of Staff for implementation. The recommendation pertaining to where the Service Test Boards and TECOM should be relocated organizationally within the Army and the one replacing ET & ST with an integrated Development Acceptance Test were not approved. In 1967, the Brown Board Report agreed with SATE that the evaluation function was being slighted, but rather than recommending any reorganization of TECOM, the Brown Board recommended major changes to Army Regulations to emphasize: (1) the evaluation process; (2) test support responsiveness of TECOM to the user (CDC), trainer (CONARC), logistics (Logistics Doctrine, Systems and Readiness Agency - LDSRA) as well as the developer. These recommendations were included in new regulations such as AR 705-5 (Army R&D), dated April 1968, AR 70-10 (Test and Evaluation during R&D of Materiel), dated December 1968, AR 71-6 (Type Classification/Reclassification of Army Materiel), dated November 1969, and DA Pamphlet 11-25 (Life Cycle Management Model for Army Systems), dated October 1968. These new regulations now require such things as development of a Coordinated Test Program (CTP) as part of the System Development Plan; they require user (CDC), trainer (CONARC) and logistician (LDSRA) participation in development of the CTP; they require user (CDC) approval of the Service Test Plan; and require user, trainer, and logistician participation in the five In-Process Reviews (IPR) conducted by the project manager and the subsequent System Status Evaluations (SSE) held by CG, USAMC. It should be noted that the new procedures described above have only been published within the last 1-2 years and the full impact of many of these changes have not really been felt on prior development programs.

In response to Congressional criticism of inadequate testing of new weapon systems and guidance from OSD that "ordinarily, full

production of a system will be approved only after operational tests and field experimentation have demonstrated acceptable effectiveness, compared to existing systems," the Chief of Staff directed a review of Army Operational Test and Evaluation procedures in June 1969. This review was rather extensive and involved the senior General Officers from the DA Staff, AMC, CDC. CONARC, and TECOM. Some of the key recommendations were:

1. That the current Service Test should be expanded to include more OT&E to be completed prior to the decision on production, (new test to be called Operational Service Test).

2. That additional test items must be made available for the new Operational Service Test (OST) to allow for testing a small tactical element, (e.g., tank platoon).

3. That the military utility of a new item of equipment must be assessed earlier in the development cycle using prototypes whenever possible (to be called Developmental Suitability Test).

4. That no changes be made in the Army's testing organization or procedures except to raise the caliber of test personnel at the Service Test Boards (i.e., Capt, Major, LTC rather than Lts), and provide additional test personnel when required to conduct OST.

5. That a more direct involvement of Center Commanders (Armor Center, Infantry Center, etc.) should be accomplished during OT&E.

6. That OT&E reports, with unfiltered comments of user, trainer, logistician, and developer, be forwarded directly to DA staff after completion of these tests.

Work is underway to revise AR 70-10 in accordance with the recommendations of the OT&E study discussed above. In addition, more emphasis is being given to such things as ensuring that good Coordinated Test Programs are being prepared, that tests are well designed to include operational aspects, and that results of tests and user comments are available for review during the decision process.

On 1 October 1969, the Army formally established a new OT&E type test organization at Fort Hood, Texas, called the U.S. Army Project Mobile Army Sensor Systems Test Evaluation and Review (MASSTER). The mission of Project MASSTER will be to insure development of an optimum battlefield intelligence gathering system as part of the Army's integrated area control system and provide for the evaluation of Army surveillance, target acquisition, and night observation matters. Project MASSTER is unique in the Army. It will run both materiel and troop evaluation using representative local troop units which will normally be found in a Brigade-size organization.

With the formation of CDC in 1962, the Army strengthened its capability to conduct good OT&E on selected items of hardware prior to production and on all equipment being issued to the Army in the field. During the past eight years there has been increased emphasis on field evaluations and experimentation at the U.S. Army Combat Developments Command Experimentation Command (CDCEC) located at Fort Ord, California. CDCEC has a dedicated Brigade-sized Army unit which provides direct support for all field experiments. When additional test units are needed; e.g., a helicopter company to run OT&E, these are moved to CDCEC for the duration of their test.

ARMY STAFF ORGANIZATION FOR OT&E

On the Army staff, the overview of OT&E is provided during the materiel development process (i.e., Operational Service Test) by the Management and Evaluation Division, Office, Chief of Research & Development (OCRD). This new Division was formed with a Test and Evaluation Branch at about the same time that the Office of Assistant Director (OT&E) was established in ODDR&E. The many changes recommended for improving the weapons system acquisition process which flowed from the SATE and Brown Board reports were taken by this new Division and used to revise Army Regulations which have been published within the last two years. The Assistant Chief of Staff for Force Development (ACSFOR) has a counterpart to OCRD which is the System Management Division. This Division monitors the user field tests, experiments and evaluations conducted by CDC and is the action office on the DA staff for all type classification actions. A very close relationship is maintained between these two

Divisions in OCRD and ACSFOR which insures maximum visibility of test results at the time when a decision has been requested on type classification of materiel.

The day-to-day staff work required for an individual major weapons system is carried out by the DA Systems Staff Officer (DASSO) in ACSFOR and the Project Monitor assigned to the hardware Directorates within OCRD.

The System Manager for Surveillance Target Acquisition and Night Operations (STANO), who is assigned to the Office of the Assistant Vice Chief of Staff (AVC/S), supervises the OT&E which will be performed by Project MASSTER at Fort Hood, Texas.

The System Manager for the SAFEGUARD missile system also works directly for the AVC/S and has a separate field command for development & testing of SAFEGUARD.

THE ARMY TESTING CYCLE

The Army method of conducting OT&E has undergone extensive review during the past year in an attempt to identify changes that might be made to our test procedures and regulations which would enable us to obtain better equipment. Some potential areas for improvement have been identified and are being incorporated in a revision to AR 70-10 (T&E During R&D of Materiel). Inclosure 2 contains the new OCRD Proposed Weapons Systems Validation Process which has been drawn up to provide increased emphasis on (1) early OT&E thru the Developmental Suitability Test, (2) obtaining early information as to any problem areas which may develop with the weapons system as a result of unusual stress found under combat conditions, and (3) ensuring direct involvement of the user, trainer and logistician throughout the testing cycle.

Before discussing the tests conducted on Army materiel, a discussion of the procedures for type classifying equipment would be appropriate. Life Cycle Phases and related type classification designations are discussed below (See Inclosures 3 and 4).

1. Development category. This category contains items that have not yet qualified for adoption. The three designations within the development category are:

a. Development type (DT). An item being developed or tested to meet an approved qualitative materiel requirement (QMR), small development requirement (SDR), other DA-approved requirement, or selected commercial items, or items of other Services, Government agencies or countries, undergoing military potential testing (MPT).

b. Limited production-urgent (LP-U) type. An item under development, available from other Services, Government agencies or countries or a commercial item which does not qualify for the adopted category (incomplete test and evaluation) but which has been approved by HQ, DA for procurement and distribution in limited quantities to meet an urgent operational requirement that no adopted item will satisfy. LP-U is a tentative type classification valid for specific geographic areas and/or distribution, and for specific periods of time, not to exceed 15 months of operational use. Items proposed for LP-U must meet the following criteria:

(1) The requirement for the item must be validated by HQ, DA (ACSFOR).

(2) Item must satisfy the requirement and involve no more than a moderate technical risk.

(3) Item can be maintained and logistically supported in the geographic area and for the time frame for which the classification is proposed. LP-U is also applicable to certain high dollar/high density items procured with PEMA funds for evaluation under the ENSURE Program (AR 71-1) as determined on a case-by-case basis.

c. Limited production-test (LP-T) type. High dollar cost or other selected major end items, which have successfully completed development acceptance testing (DAT), but successful completion of production acceptance testing (PAT) is required prior to adoption. Items which have undergone contract definition will be considered for LP-T classification prior to subsequent type classification actions. This classification authorizes the procurement of production

models in limited quantities for the purpose of conducting production acceptance testing (PAT) and other user field tests, experiments, and evaluations of the item required to support subsequent decisions and activities.

2. Adopted category. This category applies to items that have qualified for adoption as follows:

a. Standard-A (STD-A) type. A preferred and fully acceptable item which has successfully completed all required test and evaluation, meets DA-approved requirements, military characteristics, and specifications for worldwide or specified geographic areas, is totally suitable for performing the required mission, can be properly maintained and logistically supported in the area or environment in which item is to be used, and is being, or can be produced in quantity.

b. Standard-B (STD-B) type. An item, which fulfills a DA-approved military requirement and is acceptable for the stated use, but is not the preferred item to fulfill the requirement. This classification includes those items previously STD-A and being replaced by a new item, and items for which STD-B is in the initial adopted designation because the item did not meet all of the qualifications for STD-A.

3. Phase-out category. This category includes those items that are approaching obsolescence and ultimate disposal. The two phase-out designations are:

a. Contingency and training (C&T) type. An item not acceptable for U.S. Army operational requirements, but being retained to meet contingency requirements pending availability of STD-A or STD-B items, or training requirements.

b. Obsolete (OBS) type. An item no longer required or acceptable for U.S. Army use and to be withdrawn from troop use and disposed of in accordance with appropriate regulations.

Test and evaluation of materiel during R&D is a continuous series of inter-related and coordinated activities conducted to provide information, to individuals or agencies responsible for decision during the

development cycle. In general, materiel testing provides physical measurement against prescribed technical specifications and performance standards, while evaluation includes judgmental assessments in qualitative aspects of military worth and suitability considering the threat, doctrine, organization, operational employment, maintainability, reliability and other pertinent factors. Effective test and evaluation activities are wholly dependent upon continuous and vigorous participation and interaction at all levels of the developer, user, trainer and logistician agencies.

A key test planning document which is receiving major emphasis within the Army and is now required for each development program which will enter Engineering Development is the Coordinated Test Program (CTP). Preparation of the CTP is the responsibility of the developer, but the user, trainer and logistician are required to participate in the development of the CTP.

One of the unique features of Army organization for OT&E is the interaction which occurs as a result of the Center Team Concept at the various Combat Arms Centers. The Service Test Boards are collocated with their counterparts from CDC and CONARC. For example, the Armor and Engineer Board is located at Fort Knox close to the CDC Armor Agency and CONARC Armor School.

The Service Test Boards are primarily concerned with suitability of the equipment for issue to the Field Army. About half of their effort is spent on Service Testing with the remainder being spent on Developmental Suitability Tests/Military Potential Tests and Initial Production Testing.

A brief description of several of the OT&E type tests performed on Army materiel is discussed below (See Inclosure 2).

1. Developmental Suitability Test (DST). A new category of OT&E, similar to the Military Potential Test, which will be conducted during expanded contract definition to provide an early determination of potential military worth of a new system. This test will normally be conducted at a Service Test Board and use typical user personnel to operate the equipment.

2. Military Potential Test (MPT). A test of an item, component or system for which no definitive characteristics have been established, and which is conducted under the provisions of AR 705-5 for the purpose of determining whether the materiel or equipment has military potential to satisfy a stated requirement. The MPT is normally a limited test conducted under field conditions and does not negate the requirement for an Engineering Test (ET) or Service Test (ST). The MPT would be conducted by the appropriate Service Test Board or by the new Project MASSTER Test organization at Fort Hood, Texas.

3. Operational Service Test (OST). This is a new test which will expand on the previous Service Test in an attempt to obtain the most realistic operational evaluation of the item of equipment by including field exercises simulating combat operations using a small Army tactical element that would normally operate the equipment. The test materiel is operated under simulated tactical conditions similar to those expected in the areas of intended operational use. The purpose of the OST is to determine whether or not the materiel is suitable for its intended use by: (1) measuring to what degree the materiel meets performance standards specified in the requirements document, (2) field testing a small unit equipped with the materiel to form initial judgments on the overall item/unit effectiveness or military worth, and (3) testing and evaluating the materiel maintenance package.

The operational type testing described above that is conducted during the development and production acceptance testing cycle (AR 70-10) is followed closely by more extensive CT&E using materiel representative of the final production process under the overall supervision of ACSFOR and CDC.

These are user field tests, experiments and evaluations to establish the actual performance capabilities of Army equipment in the hands of the user as well as the effectiveness of organizational concepts, doctrine, tactics and tables of organization.

The CG, CDC is responsible for planning, programming, budgeting and evaluating results of troop test and field evaluations; all aspects of field experiments normally conducted at CDCDC; developing special test instrumentation; assisting, monitoring, and observing confirmatory

tests and combat evaluations conducted by other commands; and reviewing the results of all such tests and evaluations. The CG, AMC participates in the planning and conduct of confirmatory tests and supports CDC in other user tests or evaluations. All of the field commanders, including CONARC and Army overseas commanders, are responsible for conducting troop tests, field evaluations and confirmatory tests and reporting the test results to CDC. A brief description of these tests are shown below:

1. Troop test. A troop test is a test conducted by a tactical unit in the field to determine the overall workability and effectiveness of present or proposed organizational concepts, doctrine techniques and tactics or to gain further information on materiel.

2. Field evaluations. The field evaluation is conducted under normal operating conditions over an extended period of time, to examine new or revised doctrine and organization, or examining selected weapons systems.

3. Confirmatory test. This is an intensive user test conducted under field conditions by operational Army units equipped with early production models of selected weapons systems. The purpose of this test is to obtain equipment performance experience which will minimize unexpected equipment failures in combat.

4. Field experiments. The field experiment is a controlled exercise conducted to collect objective data on a specific problem area for use in developing or evaluating new operational and organizational objectives, concepts, tactics, techniques, procedures, qualitative materiel development objectives or qualitative materiel requirements.

5. Combat evaluations. These are formal evaluations designed to record experience in active combat operations as the basis for improving the effectiveness of forces currently engaged in combat and of the Army as a whole.

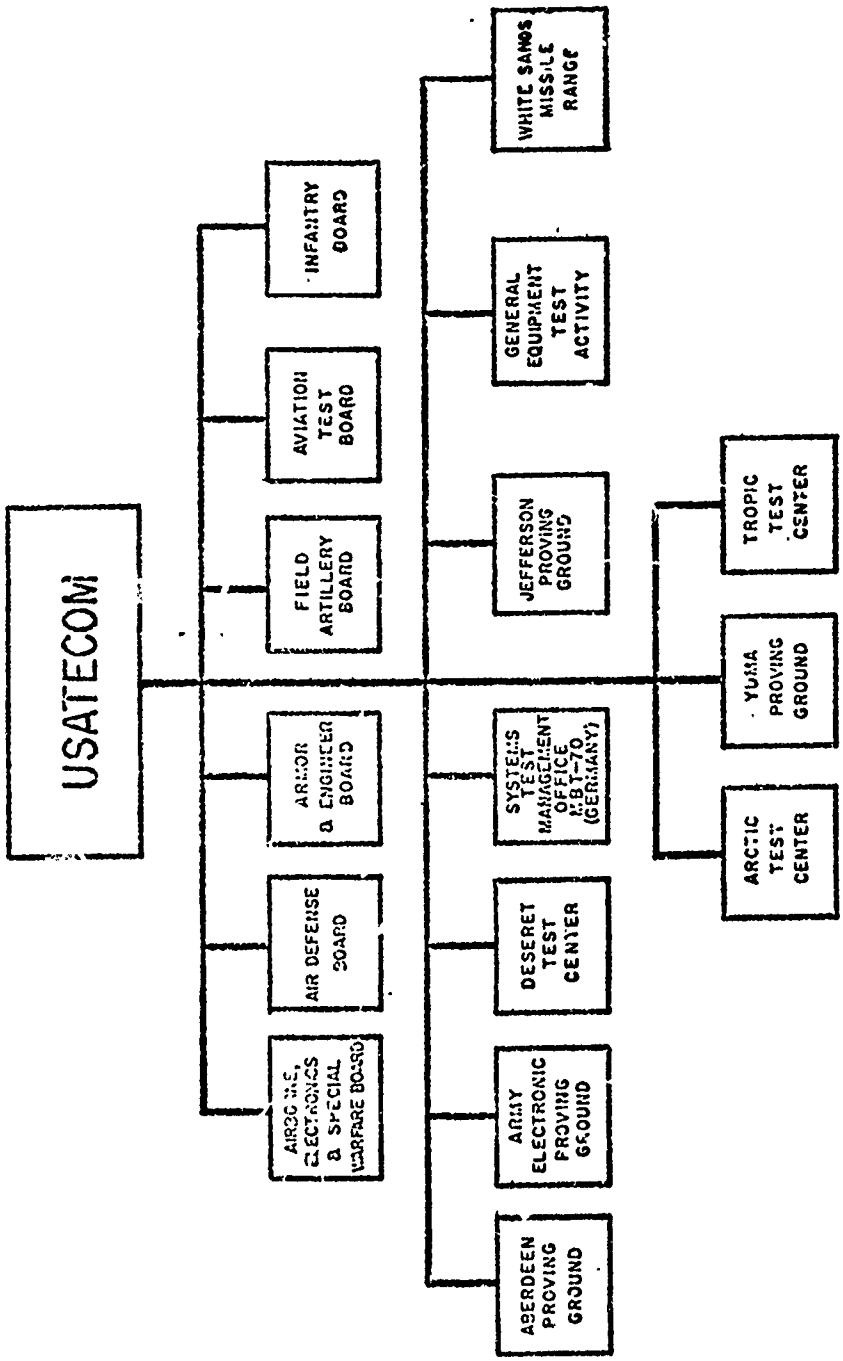
The test objectives set forth for the Project MASSTER Test Program at Fort Hood, Texas, utilizing Brigade-size Army units in direct support are listed below:

a. Improve the Army's overall combat capability through testing and experimentation in support of the development of an Integrated Battlefield Control System.

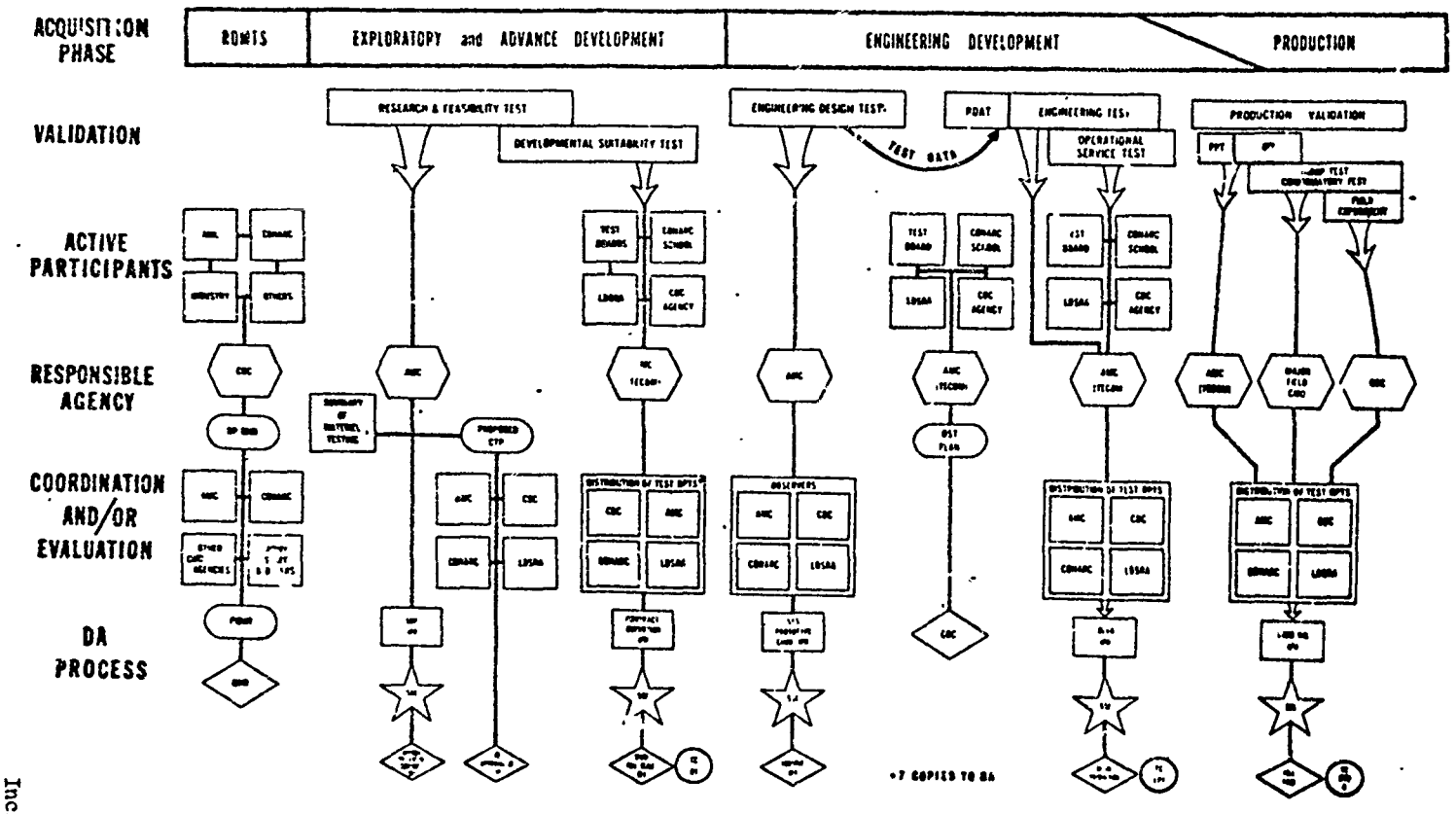
b. Recommend materiel requirements and doctrinal, organizational, and tactical concepts which will improve Surveillance, Target Acquisition and Night Observation (STANO) capability of the brigade and its supporting forces bearing in mind the interface with and support provided by the division, corps and field army.

c. Assist in insuring that STANO materiel under development or offered to the Army will meet essential needs of the Army.

The emphasis which the Army is now placing on improving the overall planning for and conduct of operational evaluations and operational testing should become evident in our weapons system development programs over the next several years. Maximum utilization of test results and insuring a close tie with the Center Commanders at our various combat arms centers should make certain that test results are placed in proper perspective when arriving at decisions on future weapons systems.

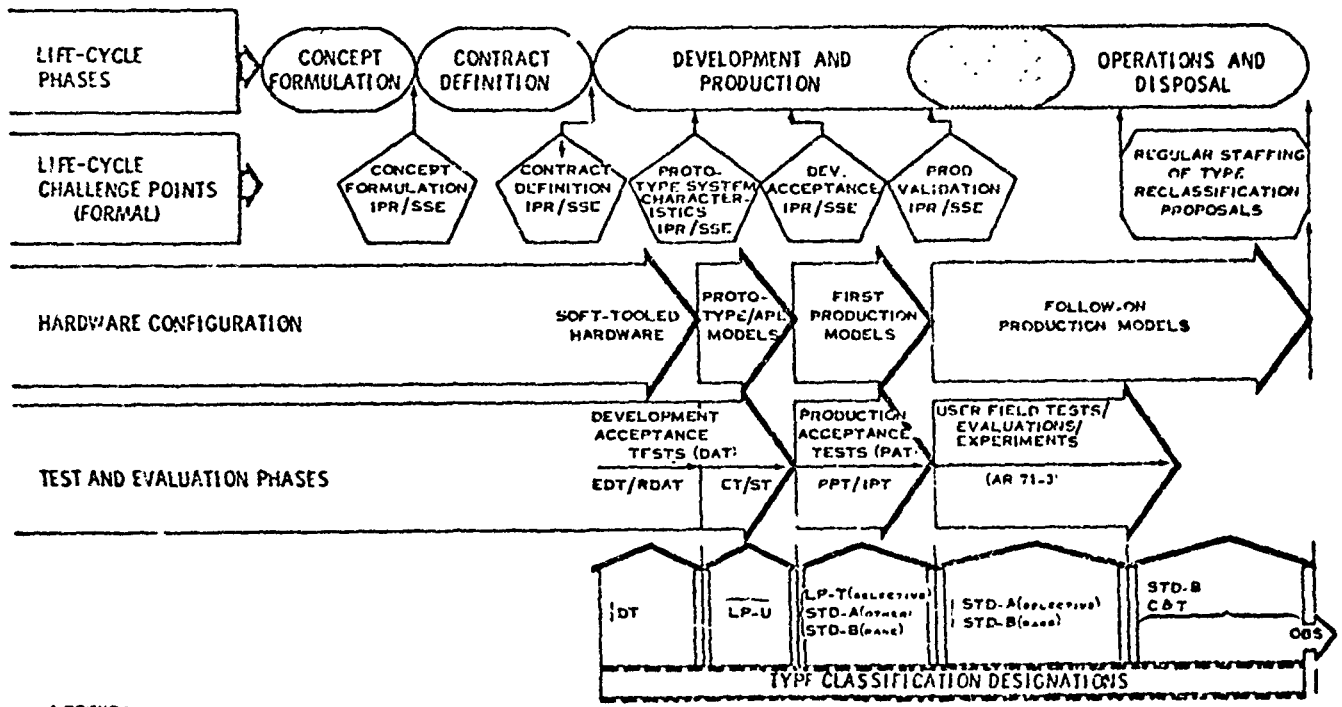

USATECOM
INFANTRY BOARD
AVIATION TEST BOARD
FIELD ARTILLERY BOARD
ARMOR & ENGINEER BOARD
AIR DEFENSE BOARD
AIRBORNE, ELECTRONICS & SPECIAL WARFARE BOARD
WHITE SANDS MISSILE RANGE
GENERAL EQUIPMENT TEST ACTIVITY
JEFFERSON PROVING GROUND
SYSTEMS TEST MANAGEMENT OFFICE MBT-70 (GERMANY)
DESERET TEST CENTER
ARMY ELECTRONIC PROVING GROUND
ABERDEEN PROVING GROUND
TROPIC TEST CENTER
YUMA PROVING GROUND
ARCTIC TEST CENTER

OCRD PROPOSED WEAPON SYSTEMS VALIDATION PROCESS



Incl 2

SYSTEM LIFE CYCLE PHASES/TYPE CLASSIFICATION DESIGNATIONS



LEGEND:

APE – ADVANCED PRODUCTION ENGINEERING
C&T – CONTINGENCY & TRAINING
DT – DEVELOPMENT TYPE
EDT – ENGR DESIGN TEST
ET – ENGINEERING TEST
IPR – IN-PROCESS REVIEW
IPT – INITIAL PRODUCTION TEST
LP – LIMITED PRODUCTION
LP-U – LP-URGENT
LP-T – LP-TEST
OBS – OBSOLETE
PPT – PRE PRODUCTION TEST
RDAT – RESEARCH & DEV ACCEPTANCE TEST
ST – SERVICE TEST
SSE – SYSTEM STATUS EVALUATION
REPRESENTS OVERLAPPING PHASES

Figure 1-1. Life Cycle Phases and Related Type Classification Designations.

TABLE 1-1 - TYPE CLASSIFICATION OF MATERIEL - RÉSUMÉ

CATEGORIES OF TYPE CLASS	TYPE CLASS DESIGNATIONS	EFFECTIVE PERIOD	CRITERIA FOR TYPE CLASSIFICATION PROPOSAL	DOCUMENTATION AND AUTHORITY TO APPROVE	IMPLICATIONS AND CONSTRAINTS
DEVELOPMENT	DEVELOPMENT TYPE (DT)	AS REQUIRED	ITEM UNDER DEVELOPMENT TO MEET QMR OR SDR; OR COMMERCIAL ITEMS, ITEMS OF OTHER SERVICES OR COUNTRIES UNDERGOING MILITARY POTENTIAL TESTING (MPT).	HQ DA PROJECT INITIATION LETTER (CRD)	SUBSEQUENT RECLASSIFICATION.
	LIMITED PRODUCTION-URGENT (LP-U)	15 MONTHS OF USE OR AS SPECIFIED OR UNTIL RE-CLASSIFIED	NEW ITEMS TO MEET URGENT OPERATIONAL REQUIREMENT WHICH NO ADOPTED ITEM FULFILLS; HAS NOT COMPLETED ENGINEERING TEST/SERVICE TEST (ET/ST); OFFERS NO MORE THAN A MODERATE TECHNICAL RISK.	PRIOR VALIDATION OF REQUIREMENT BY HQ DA (ACSFOR) AND HQ DA APPROVAL OF PROPOSAL MADE BY DEVELOPING/PROCURING OR DA HARDWARE PROPONENT (ACSFOR).	AUTHORIZATION FOR A SPECIFIC QUANTITY AND A SPECIFIC TIME FRAME (NORMALLY 15 MONTHS OF OPERATIONAL USE OR UNTIL ANTICIPATED TO AS ADOPTED). MUST BE EXTENDED OR RECLASSIFIED PRIOR TO EXPIRATION.
	LIMITED PRODUCTION-TEST (LP-T)	UNTIL RE-CLASSIFIED	HIGH DOLLAR COST OR SELECTED ITEM QUALIFIED FOR BUT NOT ADOPTED FOLLOWING SUCCESSFUL COMPLETION OF ET/ST PENDING SUCCESSFUL COMPLETION OF PRODUCTION ACCEPTANCE TESTING (PAT). ITEMS HAVING UNDERGONE CONTRACT DEFINITION ARE REQUIRED TO BE CONSIDERED FOR LP-T BEFORE ADOPTION.	HQ DA APPROVAL OF IN-PROCESS REVIEW (IPR)/SYSTEM STATUS EVALUATION (SSE) RECOMMENDATIONS AND HQ DA APPROVAL OF DEVELOPING AGENCY PROPOSAL (ACSFOR).	AUTHORIZATION FOR SPECIFIC QUANTITY AND A SPECIFIC TIME-FRAME (NORMALLY BASED ON DATE OF ANTICIPATED ADOPTION).
ADOPTED	STANDARD-A (STD-A)	UNTIL RE-CLASSIFIED	ITEM WHICH HAS SUCCESSFULLY COMPLETED ET/ST, MEETS STATED MILITARY REQUIREMENTS, AND CAN BE PRODUCED IN QUANTITY. ITEMS PREVIOUSLY CLASSIFIED LP-T MUST SUCCESSFULLY COMPLETE PAT.	HQ DA APPROVAL OF IPR/SSE AND HQ DA APPROVAL OF PROPOSAL BY MATERIEL DEVELOPER OR OTHER PROPONENT (ACSFOR).	AUTHORITY TO PROCURE WITHIN LIMITS OF COMPLETED ENVIRONMENTAL TESTING, AAO, AND BUDGETARY CONSTRAINTS.
	STANDARD-B (STD-B)	UNTIL RE-CLASSIFIED	ITEM, OTHER THAN A PREFERRED ITEM, WHICH IS SATISFACTORY TO MEET AN APPROVED REQUIREMENT. CAN BE AN INITIAL ADOPTED DESIGNATION, BUT USUALLY DESIGNATES AN ITEM BEING REPLACED THROUGH ATTRITION BY A STD-A ITEM.	HQ DA APPROVAL OF PROPOSAL BY MATERIEL DEVELOPER OR OTHER PROPONENT (ACSFOR). IF INITIAL ADOPTED CATEGORY, REQUIRES PRIOR APPROVAL OF IPR/SSE RECOMMENDATION.	ASSETS CHARGED AGAINST AAO. PRINCIPAL END ITEMS NO LONGER PROCURED W/O PROGRAM APPROVAL OF DA (DCSLOG).
PHASE-OUT	CONTINGENCY & TRAINING (C&T)	UNTIL RE-CLASSIFIED	NO LONGER SATISFIES OPERATIONAL REQUIREMENT, BUT RETAINED TO MEET TRAINING OR CONTINGENCY REQUIREMENTS FOR EITHER ACTIVE ARMY OR RESERVE COMPONENTS.	PRIOR APPROVAL OF A PHASE-OUT PLAN (DCSLOG) AND HQ DA APPROVAL OF PROPOSAL BY MATERIEL DEVELOPER OR OTHER PROPONENT. VCofSA APPROVAL REQUIRED IF ITEM IS RICC 1* (ACSFOR)	OVERHAUL REQUIRES HQ DA (DCSLOG) APPROVAL. MUST BE SUPPORTED BY CANNIBALIZATION OR WITH REPAIR PARTS ON HAND.
	OBSOLETE (OBS)	UNTIL RE-CLASSIFIED	NO LONGER ACCEPTABLE OR REQUIRED FOR US ARMY USE.	PRIOR APPROVAL OF PHASE-OUT PLAN IF ASSETS EXIST (DCSLOG) AND HQ DA APPROVAL OF PROPOSAL BY MATERIEL DEVELOPER OR OTHER PROPONENT. (ACSFOR)	ITEMS WITHDRAWN FROM USERS AND DISPOSED OF IN ACCORDANCE WITH DEFENSE DISPOSAL MANUAL, DOD 4160.21-M. OVERHAUL REQUIRES HQ DA APPROVAL (DCSLOG).

* Reportable Item Control Code 1 -- Located in SB 700-20

APPENDIX C

OPERATIONAL TEST AND EVALUATION

IN THE NAVY AND MARINE CORPS

NAVY OPERATIONAL TEST AND EVALUATION

The organization and methods used by the Operational Test and Evaluation Force most clearly define the Navy's method of conducting operational tests and evaluation.

A few Navy weapon systems have been operationally tested and evaluated through a different chain of command; for example, the Polaris missile system. For the purpose of this paper, however, the Operational Test and Evaluation Force is considered to be the Navy's operational testing organization.

A glossary of terms which may be unfamiliar to the reader is included at the end of this section of Appendix C.

COMOPTEVFOR ORGANIZATION

The mission of COMOPTEVFOR, is unique among Navy commands. The organization of OPTEVFOR is also unique. COMOPTEVFOR is a Commander in the operating forces of the Navy with operational responsibilities to CNO and the Commanders-in-Chief (CINC's) of both Fleets. He exercises operational control of various Fleet units, including three air squadrons, assigned by the Fleet Commanders-in-Chief for the prosecution of RDT&E tasks. He does not exercise administrative control of units assigned for operational control and his organizational position is therefore not akin to either that of Fleet Type Commanders or Operational Commanders within type commands.

The commanders of OPTEVFOR Squadrons and Detachments (TEVDETS) are based ashore with their staffs and carry out RDT&E project activities. These commanders report to COMOPTEVFOR, but their commands are logistically dependent to a major degree upon the base or facility which hosts and supports them.

OPTEVFOR is an independently operating portion of the Navy which is highly dependent on outside support. The Force is organized and dispersed to employ shore facilities on both coasts and sea-going resources of both Fleets. In carrying out its tasks, close liaison and coordination are maintained with elements of the Naval Material Command, System Commands, of the Navy Department. This Section describes the organization of the Force and its elements, and the relationships with other Navy commands and support activities.

COMMAND RELATIONSHIP

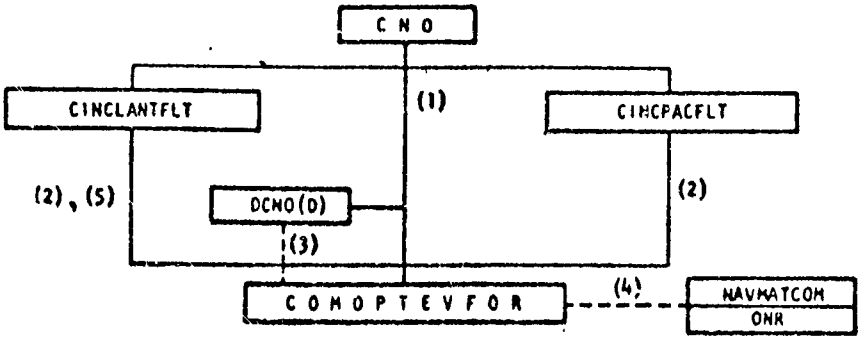
In accordance with OPNAV 5440.47B, COMOPTEVFOR is under the command of:

a. Commander-in-Chief, Atlantic Fleet for operational matters under purview of CINCLANTFLT.

b. Commander-in-Chief, Pacific Fleet for operational matters under purview of CINCPACFLT.

c. The Chief of Naval Operations for technical direction and general policy guidance for all matters relating to the overall Navy RDT&E program.

These relationships are shown in Figure 1.



1. Technical direction & general policy guidance
2. Command, operational matters. Logistic services
3. Direct access for technical matters
4. Direct liaison for technical matters pertaining to RDT&E
5. Administrative Control

FIGURE 1. OPTEVFOR COMMAND RELATIONSHIPS

OPTEVFOR COMMAND ORGANIZATION AND RELATIONSHIP

OPTEVFOR Organization

The command organization of OPTEVFOR is shown in Figure 2.

The Deputy Commander at San Diego, Commanders of the three Test and Evaluation Detachments, and the Commanding Officers of the three Air Test and Evaluation (VX) Squadrons are under the operational control of COMOPTEVFOR. The Commander also exercises administrative command of the Detachments.

The VX squadrons are technically squadrons of the Navy Operating Forces. VX-1 is under administrative control of Commander Naval Air Force Atlantic and Commander Fleet Air, Key West; VX-4 and VX-5 are under administrative control of Commander Naval Air Force Pacific, and Commander Fleet Air, Miramar and Alameda, respectively. In the near future VX-5 will come under the administrative control of Commander Fleet Air LeMoore.

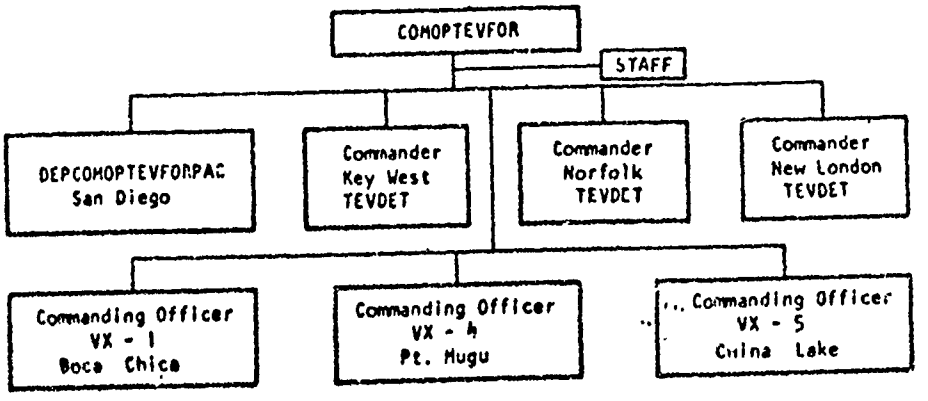


FIGURE 2

OPTEVFOR ORGANIZATION

The manning level for the Operational Test and Evaluation Force is 275 officers and 1,000 enlisted men. This includes the headquarters command and all subordinate, remotely located units.

Fleet Development Groups

Fleet Development Groups are employed by Fleet Commanders to develop Fleet ideas for new developments to determine feasibility. COMOPTEVFOR is charged by OPNAV 5440.47B to supervise the prosecution of CNO approved RDT&E projects assigned to Fleet Development Groups.

In such cases, Commanders of Fleet Development Groups report, when directed by the appropriate Fleet Commander-in-Chief, to COMOPTEVFOR for additional duty in connection with the projects so assigned. Presently established Fleet Development Groups are:

Atlantic Fleet

Submarine Development Group Two

Destroyer Development Group Two

Pacific Fleet

Submarine Development Group One

Destroyer Development Group, Pacific

Other Fleet Commands

COMOPTEVFOR is authorized by Atlantic and Pacific Fleet Commanders-in-Chief to maintain direct liaison with Fleet Commands and units in connection with RDT&E projects. DEPCOMOPTEVFOR has similar authority for Pacific projects.

Navy Shore Establishment

COMOPTEVFOR is authorized direct liaison with "Chiefs of Developing Bureaus or Offices" for all technical matters relating to the Navy RDT&E program.

NAVY STAFF ORGANIZATION POLICY

Fundamental guidance for the organization of a Navy staff is provided in Article 0508 of Navy Regulations,

> "The Staff shall be organized into such divisions as may be prescribed by the Commander or by higher authority. These divisions shall conform in nature and name, as practical and appropriate, to those of the staff of seniors in the chain of Command".

The specialized nature of OPTEVFOR functions precludes effective organization along the lines of Fleet or Type Commander staffs. The end product of Fleet and Type Commanders is Naval operations, while the primary end products of COMOPTEVFOR are reports and services.

THE HEADQUARTERS STAFF ORGANIZATION

In general, the Headquarters Staff is organized by warfare areas, as shown in figure 3, and resembles the organization of the Staff of the Deputy Chief of Naval Operations (Development), (DCNO(D)).

COMOPTEVFOR has liaison with the Office of DCNO(D). Responsibilities and Duties of the Deputy Chief of Staff for Operations include:

> "Maintain liaison with the office of the DCNO(D) (OP-07) and with other commands and activities as necessary, to carry out assigned duties".

Each of the other Staff Division Directors is directed to:

> "Maintain liaison with developing agencies....".

COMOPTEVFOR

NORFOLK HEADQUARTERS STAFF ORGANIZATION

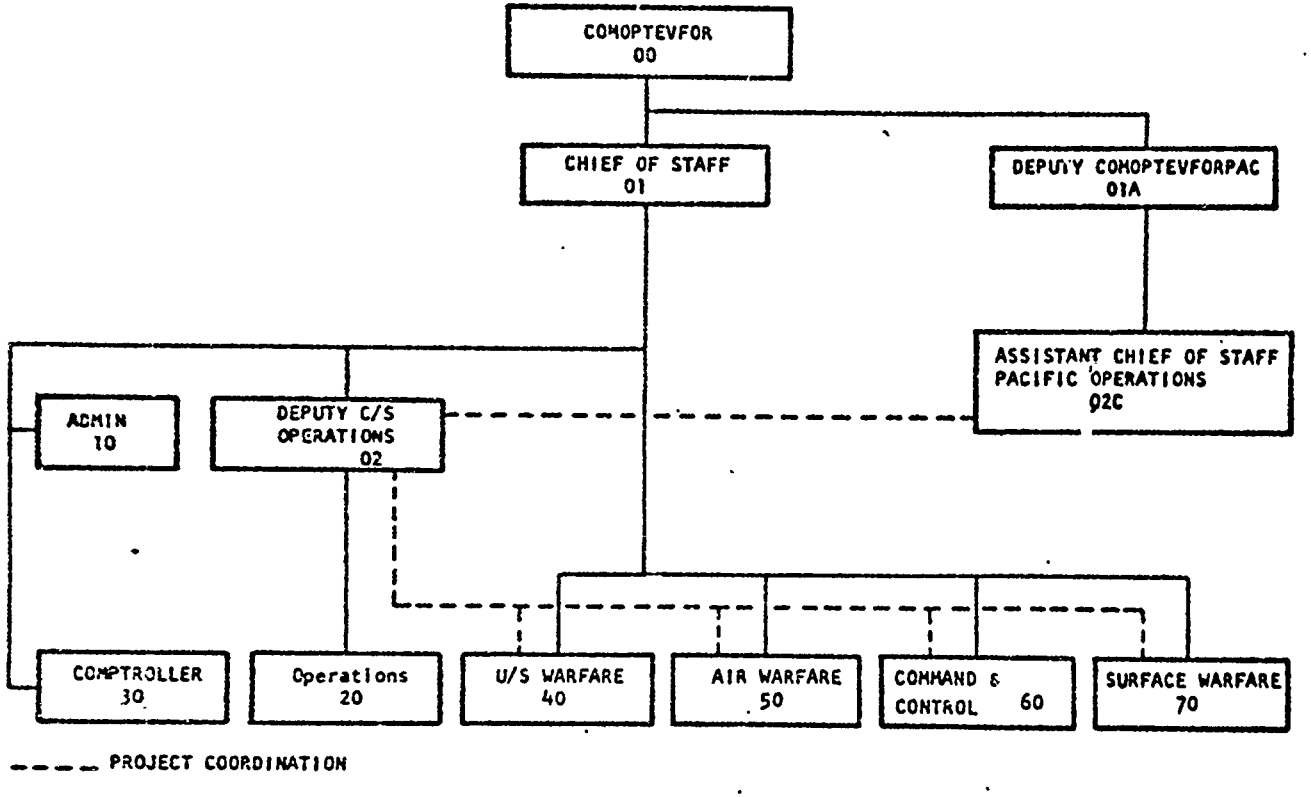


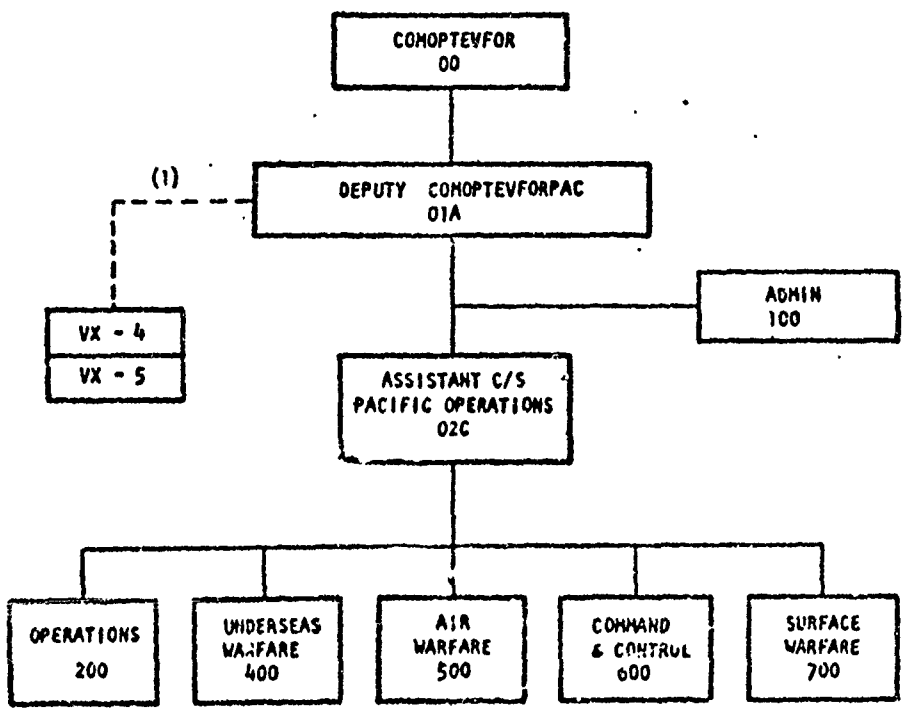
FIGURE 3

OPNAVINST 3930.8 assigns to the Development Planning Division (OP-07) within the Staff of the DCNO(D) (OP-07), the responsibility to "coordinate and promulgate all OPNAV directives to COMOPTEVFOR pertaining to test, evaluation and investigation of new developments by the Operating Forces of the Navy".

OPTEVFOR COMMANDS ORGANIZATION

Deputy COMOPTEVFORPAC Organization

The Pacific Staff (Figure 4) is organized on a near parallel with, and is considered an extension of, the Norfolk Headquarters Staff. The Charter of the Commander includes supervision of VX-4 and VX-5 activities.



(1) Supervise and coordinate

FIGURE 4. DEPUTY COMOPTEVFORPAC HEADQUARTERS STAFF ORGANIZATION

OPNAVINST 3930.8 assigns to the Development Planning Division (OP-07) within the Staff of the DCNO(D) (OP-07), the responsibility to "coordinate and promulgate all OPNAV directives to COMOPTEVFOR pertaining to test, evaluation and investigation of new developments by the Operating Forces of the Navy".

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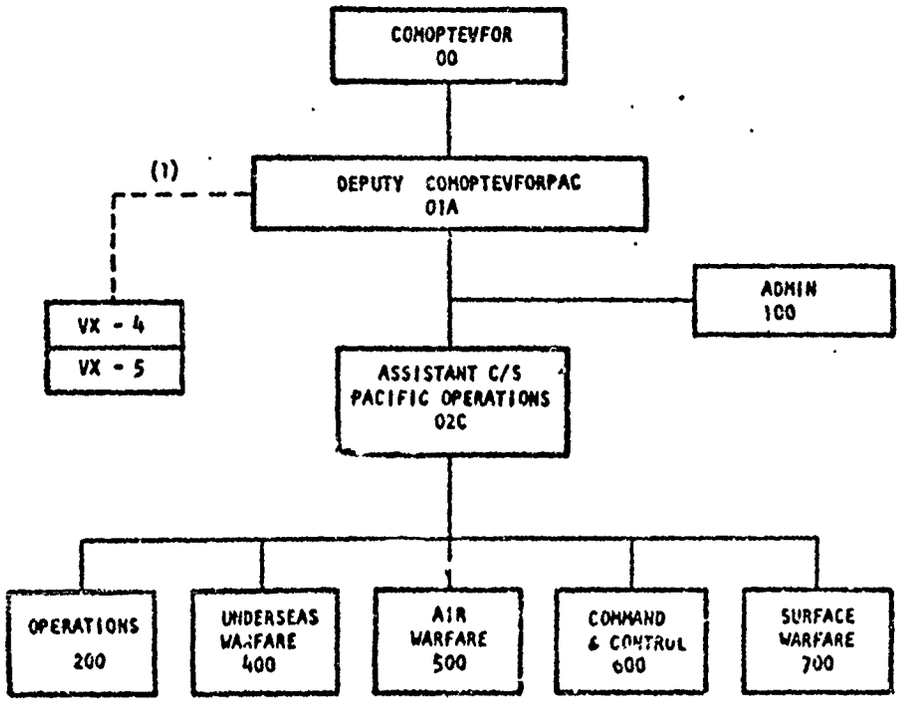


(1) Supervise and coordinate

FIGURE 4. DEPUTY COMOPTEVFORPAC HEADQUARTERS STAFF ORGANIZATION

Key West TEVDET Organization

Since its establishment the Key West TEVDET has been oriented toward Underseas Warfare. Consequently, the Key West Staff (Figure 6) is organized for and emphasizes the prosecution of underseas warfare projects, and primary coordination is with the 40 Division at Norfolk Headquarters. The Analysis Division at KWTD is unique among the detachments and squadrons of the Force as the manpower available in the division, with assistance from the OEG Representative and contractor personnel, is approximately equivalent to the total number of analysis personnel throughout the remainder of the Force.

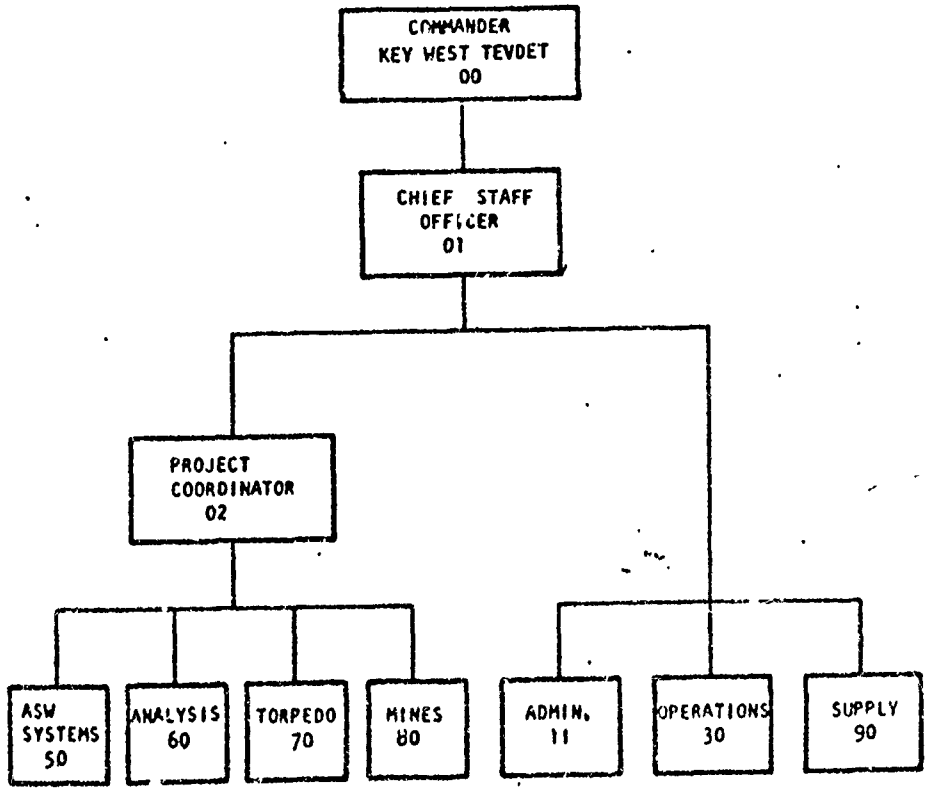
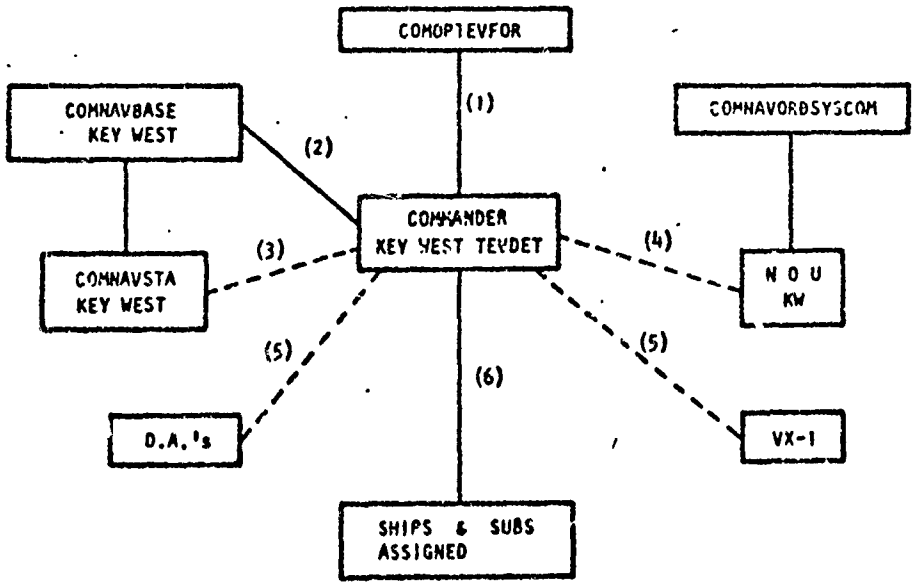


FIGURE 6. COMMANDER KEY WEST TEVDET STAFF ORGANIZATION

Key West TEVDET Relationships. The Key West TEVDET photo lab occupies borrowed quarters at the Key West Naval Base. Local area command is vested in Commander, Naval Base, Key West, who has collateral duties of COMFAIR Key West. The Key West TEVDET external relationships are diagramed in Figure 7.

Scheduling of ship and submarine services for projects is accomplished through COMOPTEVFOR representation at the CINCLANTFLT quarterly scheduling conferences.



(1) Operational & Administrative Command
(2) Command for coordination control of participation in disaster and emergency operations
(3) Logistic support
(4) Support
(5) Project Coordination
(6) OPCON and/or scheduling control

FIGURE 7. COMMANDER KEY WEST TEVDET EXTERNAL RELATIONSHIPS

Norfolk TEVDET Organization

The Norfolk TEVDET is involved primarily in command control, ordnance, and deck seamanship hardware projects. The Staff is organized into divisions as shown in Figure 8.

The Material Suitability Division (60) is a unique feature of the Norfolk TEVDET, not being established as a separate division in other elements of the Force. The Norfolk TEVDET Staff does not have an analysis group. This function is performed by the Project Analysis Branch of the Headquarters Staff. Communications services are provided the Norfolk TEVDET by Headquarters with the exception of a voice radio which is used for two-way communications with ships on TEVDET projects in the Virginia Capes operating area.

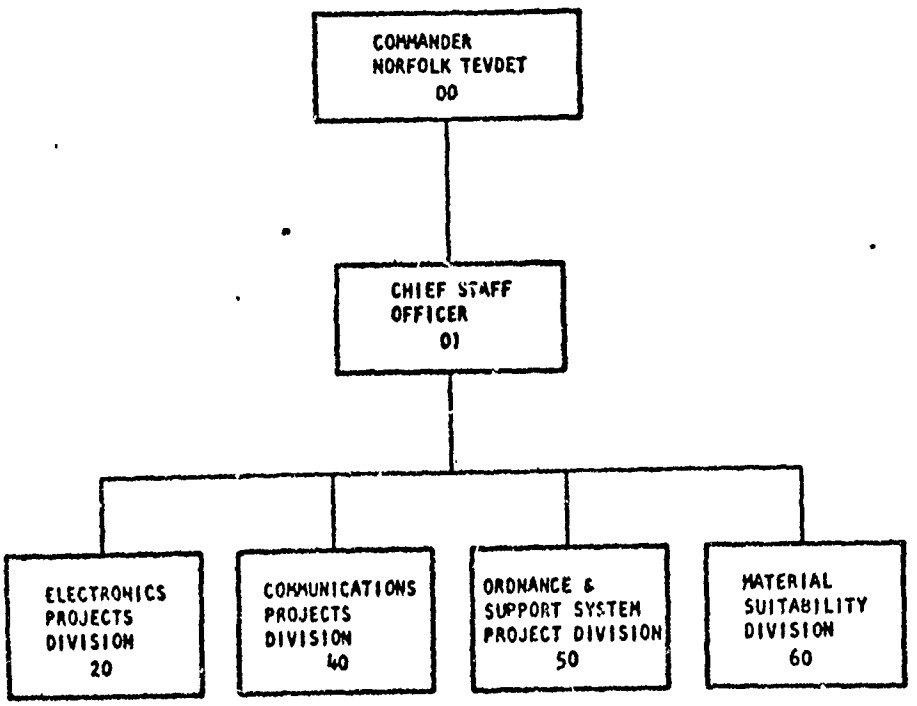
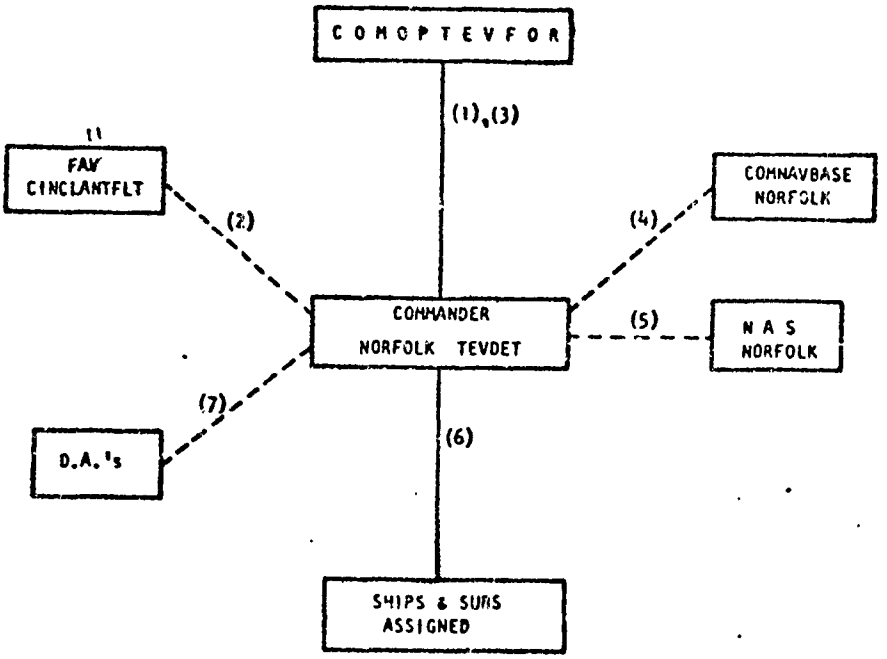


FIGURE 8. COMMANDER NORFOLK TEVDET STAFF ORGANIZATION

Norfolk TEVDET Relationships. The external relationships of the Commander, Norfolk TEVDET, are shown in Figure 9.

Scheduling of services is accomplished through the Headquarters Operations Division.



(1) Operational & Administrative Command
(2) Administration of Norfolk TEVDET assigned enlisted personnel.
(3) Communications guard for Norfolk TEVDET by COMOPTEVFOR
(4) Logistic Support
(5) Aviation Support
(6) OPCON and/or scheduling control
(7) Project Coordination

FIGURE 9. COMMANDER NORFOLK TEVDET EXTERNAL RELATIONSHIPS

New London TEVDET is staffed and organized to provide services to assist various developing agencies in the sea phase of equipment development for surface, submarine and airborne anti-submarine warfare.

There are three officers on the Commander's Staff and four enlisted personnel are assigned. The Staff organization is shown in Figure 10.

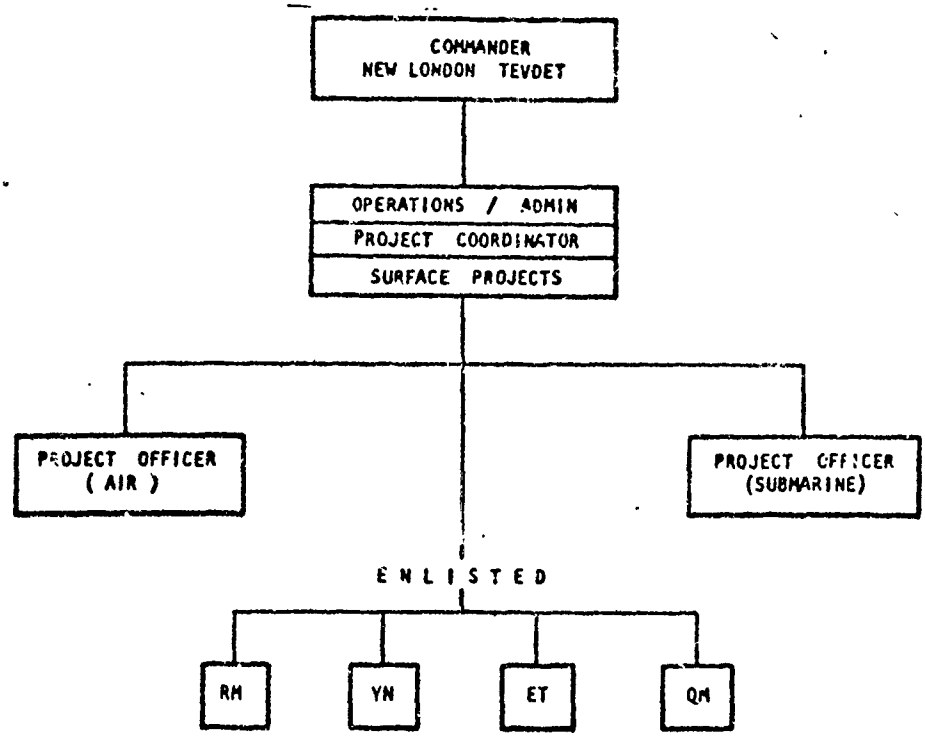
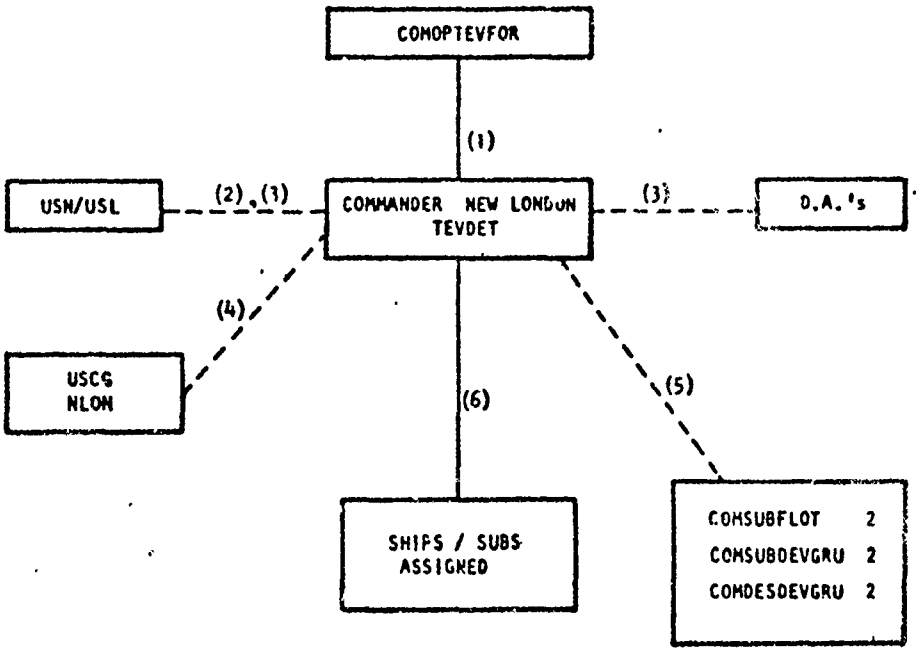


FIGURE 10. COMMANDER NEW LONDON TEVDET STAFF ORGANIZATION

New London TEVDET Relationships. The principal relationships of Commander, New London TEVDET, are with the Headquarters, U. S. Navy Underwater Sound Laboratory (USN/USL), destroyer and submarine operational commanders in the New England area, and various development agencies.

These relationships are diagramed in Figure 11. New London TEVDET occupies office space in a USN/USL building.

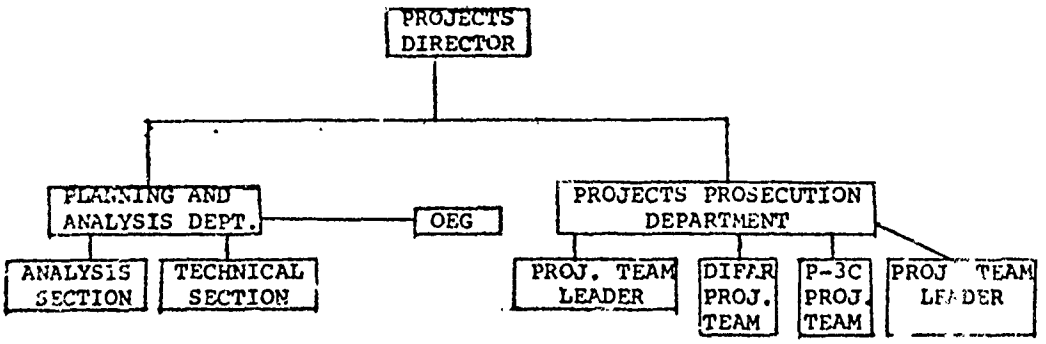


(1) Operational and Administrative Command
(2) Support
(3) Project Coordination
(4) Communications Support (message)
(5) Provision of services
(6) OPCON and/or schedule control

FIGURE 11. COMMANDER NEW LONDON TEVDET EXTERNAL RELATIONSHIPS

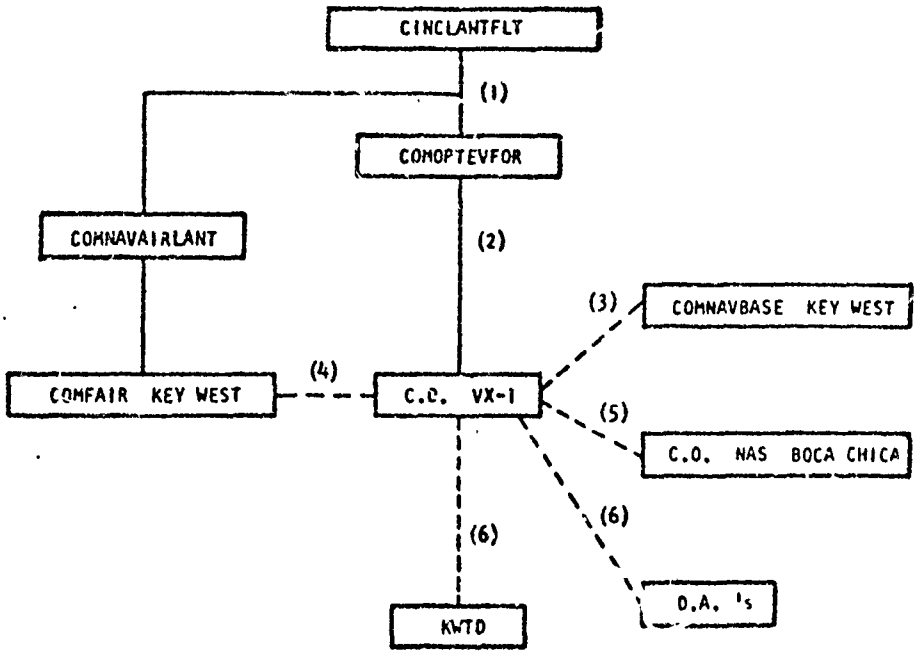
Air Test and Evaluation Squadron One (VX-1) Organization

The VX-1 Squadron, Figure below, is organized to be responsive to the test and evaluation requirements of airborne ASW systems. The Analysis Division at VX-1 is staffed by military analysts, with assistance from an OEG Representative. The squadron is organized along a project-line structure to support the P-3C evaluation.



VX-1 Relationships. VX-1 is located at NAS Boca Chica. The local area Commander, Naval Base, Key West, exercises military command of the Naval Station and Naval Air Station. He is also Commander, Fleet Air, Key West. The relationships of Commanding Officer, VX-1, are shown in Figure 12.

Scheduling of ship and submarine services is accomplished through COMOPTEVFOR representation at the quarterly CINCLANTFLT scheduling conferences.



(1) Command
(2) Command, Operational & Technical Control
(3) Local area military command
(4) Administrative
(5) Support
(6) Project liaison

FIGURE 12. COMMANDING OFFICER VX-1 RELATIONSHIPS

Air Test and Evaluation Squadron Four (VX-4) Organization

VX-4 is engaged in test and evaluation projects for fighter aircraft and fighter weapons systems. The squadron is organized to emphasize project operations as shown in Figure 13.

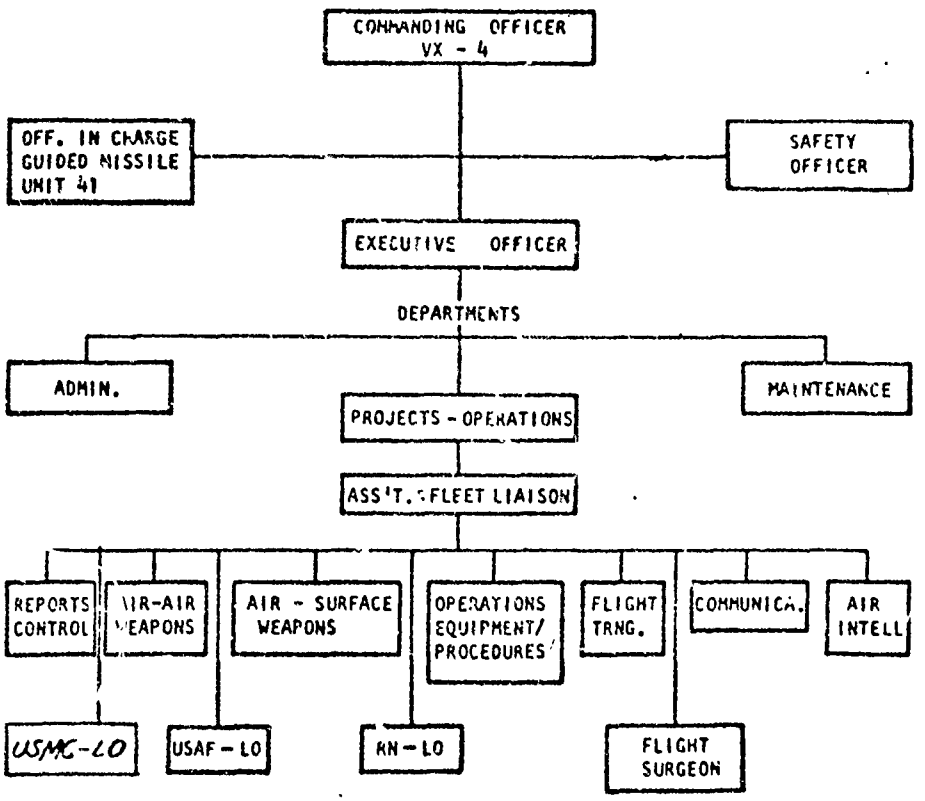
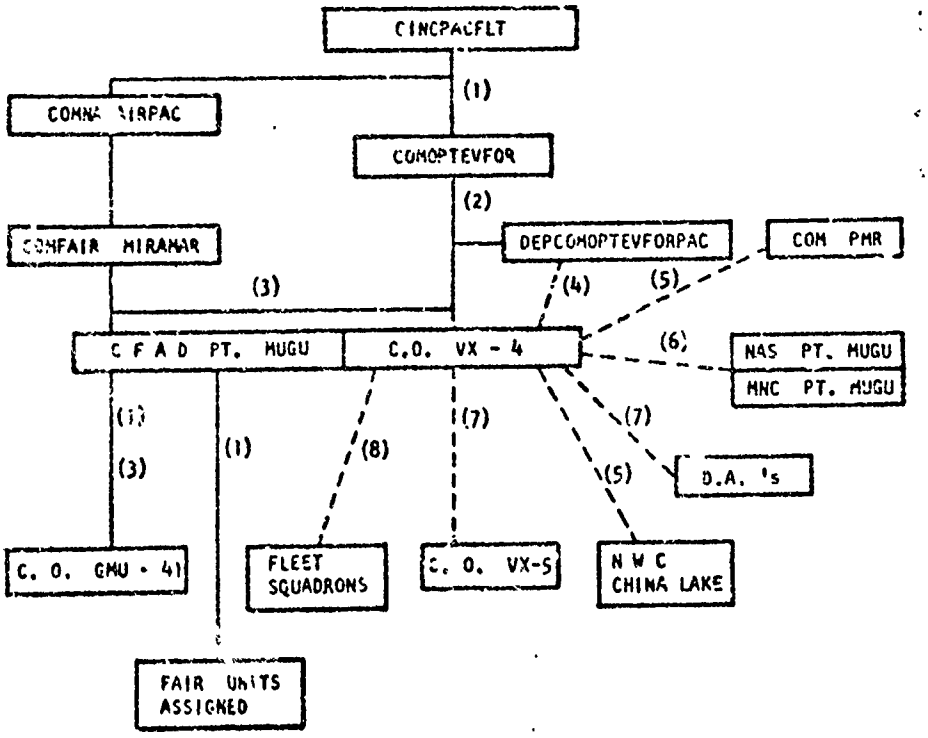


FIGURE 13. VX-4 SQUADRON ORGANIZATION

VX-4 Relationships. VX-4 is an operational squadron of the Pacific Fleet, and the Commanding Officer, as senior Fleet Naval Aviator of a Fleet air unit based at NAS, Point Mugu, has additional duties as Commander, Fleet Air Detachment, Point Mugu (CFAD).

The relationships of Commanding Officer, VX-4, are shown in Figure 14.

The instrumented ranges at the Pacific Missile Range (PMR) and Naval Weapons Center (NWC), China Lake, are used to support fighter aircraft projects. Guided Missile Unit (GMU) 41 is collocated with VX-4 and supports missile programs.



(1) Command
(2) Command, Operational & Technical Control
(3) Administrative
(4) Supervision & coordination IAW COTFINST.
(5) Range Use
(6) Base and missile services support
(7) Project Liaison
(8) Information

FIGURE 14. COMMANDING OFFICER VX-4 RELATIONSHIPS

Air Test and Evaluation Squadron Five (VX-5) Organization

VX-5 is engaged in test and evaluation projects for Navy attack aircraft and attack weapon systems. The squadron is organized with emphasis on project operations as shown in Figure 15. A VX-5 Detachment is located at NAS Oceana conducting Op Eval of the A-6 aircraft and associated systems.

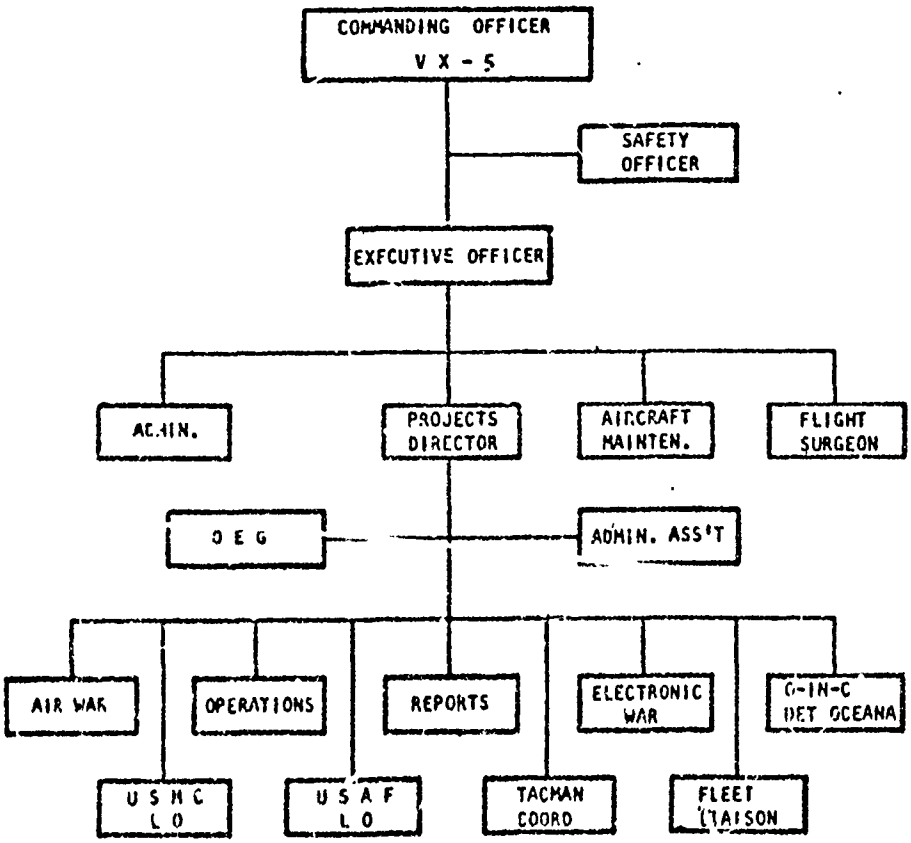
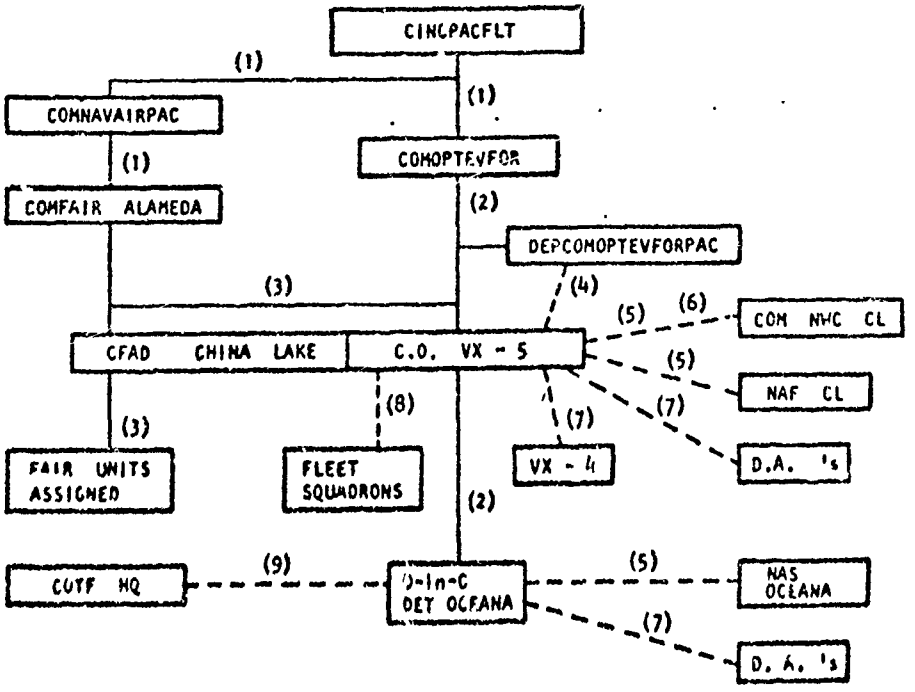


FIGURE 15. VX-5 SQUADRON ORGANIZATION

VX-5 Relationships. VX-5 is an operational squadron of the Pacific Fleet presently under administrative command of COMFAIR ALAMEDA. In the near future VX-5 will come under the administrative control of Commander Fleet Air LeMoore. As senior Naval Aviator of a Fleet air unit based at NWC, China Lake, the Commanding Officer of VX-5 has additional duties as CFAD, China Lake. The relationships are shown in Figure 16. The squadron is the principal user of NWC China Lake "Charlie" and "Echo" Ranges.



(1) Command
(2) Command, Operational & Technical Control
(3) Administrative
(4) Supervision & Coordination IAW COTFINST.
(5) Base Support
(6) Range use
(7) Project Liaison
(8) Information
(9) Analysis Support

FIGURE 16. COMMANDING OFFICER VX-5 RELATIONSHIPS

FUNDING

Under present Navy funding procedures, the Force is heavily dependent on funding support by other Navy commands and activities. The total financial resources directly available to the Commander for allocation are approximately 1.2 million dollars per year, which is less than five percent of the total cost of carrying out the tasks assigned. Of the 1.2 million dollars made available yearly, about 58% (the RDT&E,N Allotment) is basically level-funded through the Naval Ships Systems Command (NSSC) and no budgeting by COMOPTEVFOR is required. An annual budget must be submitted for O&M,N funds (about $500K) for Force use.

The financial staff at COMOPTEVFOR Headquarters consists of one Supply Corps officer. The only other Supply Corps officer in the Force is at Key West TEVDET, the allowance for Supply Officers in the VX squadrons having been rescinded within recent years. The Force is not staffed for major budgeting and accounting functions. Accounting tasks are performed for OPTEVFOR by various Fleet and shore activities.

COMOPTEVFOR presently is supported by financial resources from several appropriations with examples as follows:

RDT&E,N

1. Direct allotment (about $700K) annually via NAVSHIPSYSCOM for minor instrumentation and travel connected with projects.

2. Program VI funding which supports activities engaged in RDT&E, such as NWC, China Lake and NMC Pt. Mugu.

3. Funds which accompany some projects into the T&E phase and which have been programmed and budgeted for that purpose.

Q&M,N

1. Direct allotment annually from the OPNAV Comptroller to COMOPTEVFOR (about $270K) for general support of OPTEVFOR Headquarters, Norfolk TEVDET. This includes utilities, operations, maintenance, and minor construction at Norfolk and Norfolk TEVDET.

2. Fleet operating and maintenance funds for ships and aircraft including the VX squadrons, and for buying range time.

3. Direct allotment from OPNAV Comptroller (about $44K annually) to DEPCOMOPTEVFORPAC, and $200 for KWTD.

4. Support from shore establishment.

MP,N

1. Military Personnel costs.

PAM,N

1. Aircraft and spare parts for VX squadrons.

2. Missiles for evaluation or for testing other systems.

MILCON

1. New building for Key West TEVDET.

No direct identity is presently established with the SCN Appropriation.

Because of the wide distribution of funding support, it is not possible to develop a significantly accurate estimate of annual Navy expenditures for OPTEVFOR operations. Base support costs, for example, are not estimated by the host commands. An exception is at NWC, China Lake, where an estimate had been made of the support provided to VX-5, generally based on a prorated share of personnel on board, aircraft assigned, and similar factors; but many base services such as fire protection, security, mail and supply are not considered. Another cost of Force operations for which there is no accurate measurement is the operating cost for ships supporting T&E projects. A few Fleet ships are funded by the RDT&E Appropriation, but no estimate is made of the percentage of their costs which could be attributed to the operations of OPTEVFOR.

FUNDING OF PROJECTS

Source and Uses of COMOPTEVFOR Funds. COMOPTEVFOR receives an annual allotment of Research and Development, Test and Evaluation funds from NAVSHIPSYSCOM as CNO's agent to support its project work. The major portion of these funds are used for travel and per diem expenses of Project supervisors and Project Officers. Another large portion is used to procure general purpose, relatively inexpensive instrumentation equipment as recommended and approved by the Instrumentation

Committee. Limited funds are available to Project officers for the following miscellaneous expenses:

a. Spare and repair parts for repair and maintenance of equipments (electron tubes, adapters, batteries, connectors, switches, capacitors, motors, bushings, gaskets, bearings, cables, plugs, etc.).

b. Supplies and materials determined essential for the efficient prosecution of the project, (recording paper, armored cable, steel plates and angles, fenders, instruments, lumber, hawsers, wire rope, oxygen and acetylene gas, plastics, paint, electrical wire, hardware, etc.).

c. Services of Public Works Departments and shipyards for minor installation, repair and maintenance of equipments, installation of power lines between power sources and evaluation equipments, etc. From time to time other commands, activities, systems commands and Developing Agencies or offices give COMOPTEVFOR or its detachments additional funds to prosecute particular projects. Such fundings is arranged for by the Project Officer.

Other Support and Assistance. As tactics, systems and equipments become more complex and sophisticated, COMOPTEVFOR depends more upon the support and assistance of the Developing Agencies and System Commands.

a. OPNAV INSTRUCTION 3960.1 (series) prescribes that the Developing Agency will assist COMOPTEVFOR in the preparation of the technical phase portion of the project plan, will furnish required material and technical support, including spare parts

and special test equipment, and will make necessary arrangements for furnishing the installation and removal of equipment.

b. The project assignment letter or message from CNO often tasks a Systems Command, CNM or a particular activity such as NWC China Lake or NAVMISCEN to provide support for a specific project.

c. Other examples of support are:

(1) Target and aircraft tracking services from weapons ranges.

(2) Telemetry readout from FMSAEG.

(3) Target, aircraft tracking and telemetry services from NMC/PMR.

(4) Project instrumentation and data analysis services from APL/Johns Hopkins University.

(5) Missile preparation and certification for tests by NWS Yorktown, Charleston, Seal Beach and Concord.

(6) Range services and tracking data from ETR Cape Kennedy and NOU Patrick AFB.

(7) Ship system checkout, trouble shooting, personnel training for project ships, and installation of instrumentation from NAVSHIPS ENGSTA Port Hueneme.

(9) Ship and aircraft services from the TYCOMS and numbered fleets (scheduled by Operations Division).

(10) RAV and TAV for ship checkout and instrumentation installation from the TYCOMS and numbered fleets.

(11) Scheduling of services by the JAX and VACAPES

area coordinators.

(12) Instrumentation and data analysis from NOTS China Lake.

(13) Photographic services from Camera Group, Atlantic and Pacific and the Naval Photo Center Anacostia.

(14) Computer services from the LANTFLT OPCON Center and Fort Eustis (Army).

(15) Procurement and installation of equipment to be evaluated from the developing SYSCOM, agency or office.

(16) Data acquisition, analysis and reduction services from the developing SYSCOM, agency or office.

(17) Training of personnel by fleet schools.

(18) Test ranges for project operations by AUTEC, AFWR, NOLTF Fort Lauderdale.

(19) Computer support from NOTS Pasadena.

Funding of Ships Under the Operational Control of COMOPTEVFOR

a. Supplies, equipage and maintenance are funded by the Type Commander.

b. When COMOPTEVFOR is responsible for evaluation of a major equipment such as a complete missile system or a new radar, the sponsoring Systems Command or Developing Agency is responsible for financing the installation of the equipment and the costs of replacement parts and components required to keep the equipment operational.

c. COMOPTEVFOR is responsible for the procurement of the tools of the evaluation such as test equipment, photographic supplies, magnetic tape, and miscellaneous consumable hardware.

Responsibilities of Project Officer.

a. From the information available in the TDP, project assignment letter and liaison with the Developing Agency, determine and itemize the estimated funding requirements in:

(1) personnel

(2) material

(3) services

(4) schools

(5) travel and per diem

b. Discuss with the cognizant Developing Agency and the Force comptroller the funding of the above items.

c. Obtain the assistance of the Comptroller in costing requirements where necessary.

d. Arrange for support and special funding that may be required.

COMOPTEVFOR MISSION AND FUNCTIONS

The environment in which the Commander Operational Test and Evaluation Force undertakes to fulfill his mission has undergone change since the Force was chartered. Department of Defense procurement policies and procedures, and the RDT&E process itself, have undergone major revision.

The Department of the Navy has experienced major reorganizations, the latest occurring in May 1966. The organizational and policy changes have had an impact upon OPTEVFOR. In addition, the systems and subsystems that OPTEVFOR tests and evaluates have become more complex, and the evaluations require a high level of technical and operational competence.

Complex systems require lengthy RDT&E life cycles and the procurement decision may become mandatory prior to completion of the system's operational evaluation. Consequently, OPTEVFOR responsibilities are often directed toward identification of deficiencies in systems in use and recommendations for improvement.

Computer technology, simulation and modeling, and comprehensive data analysis techniques now are available to evaluate thoroughly major system capabilities, to minimize usage of critical Fleet services, and to reduce the total evaluation time. Sophisticated resources and tools such as AUTEC now are available to conduct Navy test and evaluation.

COMOPTEVFOR MISSION

The mission of COMOPTEVFOR is assigned by the Chief of Naval Operations in OPNAV 5440.47B and summarized as follows:

> "Test, investigate, appraise, and/or evaluate specific end items, systems, tactics, procedures, and develop tactics and procedures, as specifically assigned. When directed by the Chief of Naval Operations, assist developing agencies."
>
> "The overall mission is intimately related to the furtherance of the Navy's RDT&E Program."

COMOPTEVFOR FUNCTIONS

The functions of COMOPTEVFOR and other elements of the operating forces engaged in RDT&E projects are assigned by CNO in OPNAV Instructions 5440.47B and 3960.1D.

These functions are illustrated by the eight general types of projects which may be assigned to COMOPTEVFOR. Most can be sub-classified as having primarily airborne, V, ship or submarine, S, or combined, C, application. The project types and their designations are shown in Table

Table Types of OPTEVFOR Projects

Project Type	Designation
Operational Evaluations	
1. Ship/Sub	O/S
2. Airborne	O/V
3. Combined	O/C
Technical Evaluations	T/S, T/V, T/C
Concurrent Evaluations (Tech/Op)	C/S, C/V, C/C
Development Assists	D/S, D/V, D/C
Fleet Research Investigations	F/R
Fleet Operational Investigations	F/O
Operational Assists	X/S, X/V, S/C
Operational Appraisals	P/S, P/V, P/C

To demonstrate the functions of OPTEVFOR, the work contents of these types of projects are briefly summarized below.

Operational Evaluations (Op Eval). The test and analysis of a system, component, or equipment under service operating conditions, to determine ability to meet specified operational performance requirements and design specifications and to establish suitability for service use.

A secondary purpose may be determination of tactics.

Technical Evaluations (Tech Eval). The tes. and analysis required by a Developing agency (DA) to determine whether a weapons system, support system component equipment, or material meets design specifications, is functioning in a technically acceptable manner in its operational environment, and is technically suitable for an Operational Evaluation.

Concurrent Evaluations. The combination of a Tech Eval and Op Eval into a single project, assigned only for systems or components of such size and complexity that significant savings in time and resources will result. A concurrent evaluation is not the simultaneous conduct of these evaluations, but includes simultaneous prosecution of those tests or other project efforts which are common to each.

Development Assists. Fleet support to developing agencies (DA's) for tests needed to assist in development of a system or equipment or for gathering of data needed to determine the direction in which development should proceed. These tests also may relate to material improvements of equipment already in the Fleet.

Fleet Research Investigations. Examination of natural or special phenomena in an operational environment required by a developing agency in prosecution of research and for which the assistance of the operating forces is needed.

Fleet Operational Investigations. Development, examination, or comparison by the operating forces of tactical concepts, operating procedures, or techniques. These investigations usually involve optimizing use of the

equipment and systems already in the Fleet.

Operational Assists. The gathering of performance data on a subsystem or component prior to either a Tech Eval or Op Eval. These tests provide essentially a "quick look" evaluation in those cases in which decisions must be made as to the worth of a course of development, usually in modifications to existing equipment.

Operational Appraisals. The appraisal of systems, subsystems, or components installed and/or operated in Fleet units without an Op Eval.

The functions assigned to COMOPTEVFOR in each of the above project types are summarized in Table /.

COMOPTEVFOR FUNCTIONS RELATED TO THE RDT&E CYCLE

The time-phased relationship between the RDT&E cycle and the assignment of projects to COMOPTEVFOR is indicated in Figure /7. The Force is involved, in varying degrees, with all categories of RDT&E from basic research to evaluation of newly developed equipment and appraisal of systems in service use. This involvement in the early categories of RDT&E Research, Exploratory and Advanced Development is ordinarily on the basis of requirements for Fleet service assistance. Fleet introduction of the material being tested normally is several years hence, if ever. An exception is the case of some minor hardware items which routinely go from exploratory development to Fleet use. Some of these may be given to OPTEVFOR for Op Eval.

Equipment which has progressed into the category of engineering development or contract definition, has imminent Fleet use and OPTEVFOR becomes involved in the test and evaluation planning. The opinions and advice of COMOPTEVFOR are included in the Test Section of Technical Development Plans for systems which he will ultimately evaluate, or which are of such complexity that a system performance model will be used in the development process.

Examination of the projects assigned to COMOPTEVFOR indicates that the Force is less apt to be involved early in the development cycle for aircraft and airborne equipment, than for ship or submarine equipment. Aircraft and airborne equipment are more often deployed prior to Op Eval than are ship or submarine systems. This situation may be attributed to the availability of approximately 200 Navy aircraft for the R&D phases of projects. OPTEVFOR assistance and involvement in early phases of airborne developments are influenced by the availability of the required aircraft configuration (examples being the F-4J/AWG-10). The Force has never been requested to assist in an airborne Tech Eval; however, concurrent evaluations have been assigned.

Development Assist Projects

Force involvement in assist projects is, in theory, primarily one of liaison and scheduling of Fleet services in support of developing agencies. About 60% of the projects now assigned to the Force are development assists.

Table 7. COMOPTEVFOR Project Functions

	Type of Project							
	C/S C/V	D/S C/V	F/O	F/R	O/S O/V	T/S T/V	X/S X/V	P/S P/V
a. Submits comments to CNO on project request.	X	X	X	X	X	X	X	X
b. Assigns relative priority.	X	X	X	X	X	X	X	X
c. Prepares project plan.			X		X		X	X
d. Prepares project plan, coordinating with the DA for technical phase portions.	X							
e. Arranges for and coordinates Fleet support.		X		X		X		
f. Determines Fleet support requirements and arranges for same.	X		X		X		X	X
g. Ensures readiness of Fleet units. Ensures installation plans have been approved by the DA or a designated building or overhaul facility for the Fleet unit on which the equipment is installed.	X	X	X	X	X	X	X	X
h. Prepares OP orders.	X	X	X	X	X	X	X	X
i. Reports "Project Readiness."	X				X			
j. Advises the operational commander on the projects to be prosecuted.	X		X		X		X	X
k. Monitors project progress and reports to CNO as directed.		X		X				
l. As appropriate, submits recommendations to CNO to terminate, extend, or modify projects.	X	X	X	X	X	X	X	X

Table 7. COMOPTEVFOR Project Functions (Cont'd)

	Type of Project							
	C/S C/V	O/S O/V	F/O	F/R	O/S O/V	T/S T/V	X/S X/V	P/S P/V
m. Upon completion of tests, furnishes report to CNO of support provided and such other reports as specified by CNO.		X		X		X		
n. Reports results to CNO with appropriate conclusions and recommendations concerning suitability for service use.	X				X			
o. Collects and analyzes data and reports results to CNO and activity requesting the project.	X		X				X	X
p. Prosecutes tests with assistance of DA.						X		

TIME RELATIONSHIPS OF TYPES OF PROJECTS IN THE RDT&E CYCLE

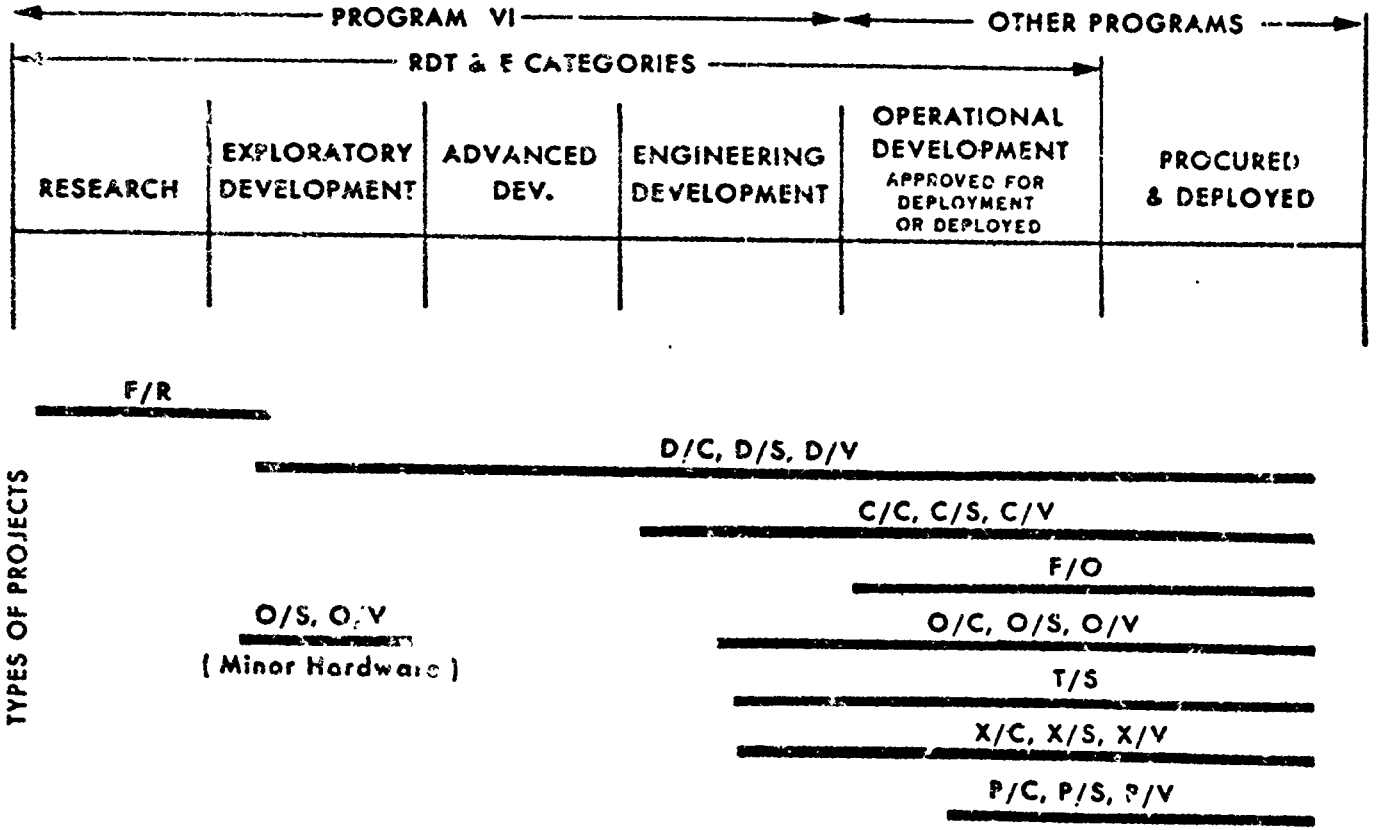


FIGURE 12.

Fleet research services and technical evaluations are assist type projects and impose about the same general requirements on the Force. Development assists may be assigned (and have been) for projects ranging from exploratory development to deployed systems.

In the case of airborne development assists, the Force often becomes the provider of services and is more deeply involved than "liaison and scheduling." VX-1 is assigned a greater number of assist requests than VX-4 or VX-5, probably due to the scarcity of P-3 aircraft outside operational squadrons. For some surface assist projects, the liaison and scheduling services require a substantial amount of manpower and time (viz., D/S-315, the Torpedo MK-46, Mod 1). In some cases, the concurrent or operational evaluation for the equipment is imminent and a good familiarity base can be established through Force involvement in the assist project.

Operational Evaluations

Operational (and concurrent) evaluations are the principal functions of the Force and its primary reason for existence. In the classical sense, these should be completed prior to the equipment being procured in quantities and deployed. The demands for new and better systems to meet new threats, the 1 - 1/2 - 2 year lead time inherent in planning for and obtaining appropriations, the time required for tooling in industry and the apparent economy

in early and quantity procurement commitments all work against allowing adequate time for evaluation prior to deployment. CNO has established guidance in OPNAV Instruction 3960.1D that:

> "With increasingly complex systems coming into being it is more than ever necessary to test and evaluate systems thoroughly in a wide range of operational environments."

In view of this guidance, the Op Eval functions of OPTEVFOR have increased in scope for the complex projects.

Fleet Operational Investigations

Some of these projects equal or exceed many Op Evals in urgency, complexity, and demands on resources. They usually have one or more of three broad objectives:

1. Determine how to get the most out of a system introduced prior to Op Eval.
2. Determine if the system will operate in a mode for which it was not designed nor intended.
3. Determine methods to use systems in an environment not previously considered.

The requirement for projects of this type and the need for special test and evaluation abilities beyond the operating forces are apparent when the test objectives are examined. Many could not be effectively prosecuted by the operating forces as they are now organized and staffed.

Tactics

One of the missions of COMOPTEVFOR is to "test, evaluate, appraise, and develop tactics." The extent to which this function is performed varies among elements of the Force. In the tactical warfare area, VX-4 and VX-5 are involved heavily and a substantial portion of their efforts are directed toward development of tactics and aircraft tactical manuals (TACMANS). Projects such as F/O-210, O/V-28, and O/V-37 are a fundamental source of urgently required tactical information for Fleet squadrons.

In undersea warfare there is less Force involvement in tactics development. The submarine forces develop their own tactics and the same is generally true of Fleet ASW groups. VX-1 does not have the same obligation on TACMANS for ASW aircraft as have the tactical air warfare squadrons.

Reports

COMOPTEVFOR is required to "report formally to CNO the results of operational evaluations and concurrent operational tests and evaluations with recommendations in connection therewith," Reference (a). Reports may be formally submitted during the course of an evaluation as Preliminary, Progress, or Partial Reports to provide information on knowledge gained to date. A Final Report is Submitted on completion of an evaluation project, and this may be followed by a Supplementary Report if additional and significant data become available after the Final Report is submitted.

Commanders of Force elements may be directed to prepare and distribute Advance Evaluation Notes (AEN's) for material under evaluation. The purpose the AEN is to provide timely operational training or maintenance information to Fleet units using the systems. AEN's are promulgated extensively by the Air Test and Evaluation Squadrons for aircraft airborne systems deployed but still under evaluation.

PROJECT REPORTS - DESCRIPTION AND PREPARATION

General. COMOPTEVFOR reports are read by a wide audience with diverse backgrounds and different areas of interest. Some members of this audience require an extensive amount of technical detail while others do not. For example, an agency responsible for the correction of equipment deficiencies will require a detailed technical description of the project equipment. Conversely, a decision maker or Fleet user may require only a functional description of the equipment. The Project Officer is charged with the responsibility of writing a report which meets as nearly as possible the needs of all readers.

Objectives. The objectives of project reports are:

a. To advise the Chief of Naval Operations of the results of an Operational Evaluation or Concurrent Evaluation concerning an item or system in order that a decision may be made concerning its acceptability for service use.

b. To advise the Fleet and other appropriate commands of the capabilities and limitations of the equipment or system tested.

c. To advise the Chief of Naval Operations, systems commands and other technical agencies of deficiencies, and to make recommendations for improvement to the equipment.

d. To provide the Chief of Naval Operations and other interested commands with recommended tactics. These tactics may apply to standard Fleet equipment or systems, or to newly evaluated devices which are recommended for service use.

e. To provide the Chief of Naval Operations and interested commands with recommendations for design, documentation, test equipment/test points, logistic spares and/or manufacturing techniques, personnel manning and training requirements, and other material/human factors implications incident to adoption of a new equipment, weapon or system.

f. To record, in readily accessible form, the detailed information which has been purchased at extraordinary expense and for which needs may arise in the future.

Timeliness of Project Reports

In the prosecution of any project it is important that pertinent and accurate data be obtained as soon as practicable and that an accurate analysis of data and conclusions be submitted promptly in order that the Navy may capitalize on the time, effort, and money expended in the prosecution of the project. Although accuracy and sound reasoning are paramount, it must be recognized that the value of the work done deteriorates with delay in completing the project report.

Reports to COMOPTEVFOR from Prosecuting Commands

a. Routine Periodic Reports. Such reports are submitted to indicate the status of active projects and to summarize progress made in the overall evaluation program. These reports normally have distribution only within OPTEVFOR.

b. SITREPS (Situation Reports) or Firing Reports. In certain projects which are of priority interest to COMOPTEVFOR, timely reports of project progress are required while tests are being conducted in the field. When stipulated in the project plan, SITREPS and/or firing reports will be sent "Action" to the prosecuting command and "Information" to COMOPTEVFOR, as well as to DEPCOMOPTEVFORPAC by commands prosecuting projects in the Pacific, at specified intervals during the prosecution of a project. These reports will be drafted by the appropriate on-the-scene prosecuting command representative (normally the Project Officer). Unless specifically authorized, SITREPS and firing reports will not be sent to any activity or command external to the OPTEVFOR organization. When these reports do include an external command as information or action addressee, and/or when originated through an external command, the report will commence with the words "(Prosecuting Command) REP SENDS." The words "OPTEVFOR REP SENDS" will be used only in those instances where a Staff Headquarters representative is the drafter.

When appropriate, such reports will include the concurrence or nonconcurrence of other commands or parties. Firing reports and SITREPS shall be numbered consecutively and the final report shall be identified by including the word "FINAL" after the report number (SITREP 19 FINAL). The SITREP shall be narrative in style, whereas the format of the firing report shall be as stipulated in the project plan.

c. Deficiency Report

(1) A deficiency report in letter, speedletter, or message form shall be submitted to the prosecuting command, information to COMOPTEVFOR (and DEPCOMOPTEVFORPAC for Pacific projects) by any ship or subordinate command prosecuting a project, when the project is being delayed because of its manifest unsuitability for evaluation, lack of required support, or prolonged delay in delivery of equipment. Deficiency reports are also desired on equipments exhibiting design deficiencies even though such deficiencies may not delay project operations. When the prosecuting command's Project Officer is embarked, he will submit the deficiency report and will preface the message, "(Prosecuting Command) REP SENDS." Deficiency reports will be numbered consecutively.

(2) The deficiency report shall contain the following information as applicable:

(a) Non-availability of the test material if untimely delivery of material will delay scheduled project operations. Indicate what action was taken by the prosecuting command to effect delivery and reasons for delay.

(b) Non-readiness of the equipment, as delivered, for immediate conduct of evaluations, including a brief summary of deficiencies of equipment, action taken to correct them, man-hours required to make equipment operable, and outside assistance required.

(c) Information wherein equipment is manifestly unsuitable for evaluation due to major design deficiencies, gravely inadequate performance, or other specified reasons. Include recommended action.

(3) COMOPTEVFOR may, in turn, submit a deficiency report to the cognizant SYSCOM, activity, or office concerned with the material, with an information copy to CNO, the Chief of Naval Material, and the activity reporting to COMOPTEVFOR. COMOPTEVFOR deficiency reports will be numbered consecutively.

d. Preliminary Report

(1) For projects which require an early report to CNO to furnish data on which material procurement decisions are to be made, a preliminary report will be submitted by COMOPTEVFOR. When required by the project plan, this report will be prepared and submitted to COMOPTEVFOR by the prosecuting command by letter or message as soon as preliminary data reduction indicates that valid conclusions and recommendations can be made.

(2) A precise format for the preliminary report is not specified. Where results are of a very tentative nature it may be essentially narrative in style. In instances where results are virtually complete, then the preliminary report shall be subdivided, as feasible, into DESCRIPTION, RESULTS,

OPERATIONAL APPLICATIONS, CONCLUSIONS, and RECOMMENDATIONS. In all preliminary reports the first paragraph will include the statement that: "Conclusions and recommendations are based on incomplete analysis of the data and are subject to verification and possible revision when data analysis is complete." Any deviation from the preliminary results, conclusions and/or recommendations set forth in the preli- report shall be noted in the next formal report on the project.

e. Progress Report

(1) COMOPTEVFOR may direct that a progress report be submitted by the activity designated to prosecute a project when any of the following conditions exists:

(a) The prosecution of a high priority project requires the reporting of early and/or continuing results to CNO in order to provide data for a decision in connection with material procurement.

(b) It is necessary or advisable to invite the attention of CNO to the status of a project or special circumstances surrounding it, or to present limited evaluation results from tests to date.

(c) An extended period of time is required to complete a complex project which is not subdivided readily into separate parts, tasks or phases.

(d) Unresolved difficulties in the analysis of a project are to be reported.

(e) The prosecution efforts uncover elements

of inconsistency, inappropriate coordination or planning, or inadequacy of assistance from supporting agencies or systems commands.

(2) Progress reports shall be by letter, speed-letter, or message, as appropriate. Under routine conditions, reports of more than three pages should not be sent by message. Reports shall be numbered in sequence for each project. The substance of a progress report shall be included in the next partial or in the final report on the project.

(3) The contents of a progress report shall include the following:

(a) A list of pertinent references and enclosures.

(b) The first paragraph shall brief the references.

(c) The second paragraph shall be entitled "ABSTRACT" and shall summarize briefly the substance of the report. Subparagraphs within this section shall be lettered alphabetically.

(d) The remainder of the report shall follow the general form of a final report, but may be very brief, with each numbered paragraph entitled with the applicable section title as listed in article 509. Subparagraphs appearing under each of the above sections shall be lettered alphabetically within each section.

(e) Conclusions and recommendations shall be included in the report provided that test results are considered sufficiently valid.

(f) When the report involves equipment, suitable identifying or descriptive photographs and diagrams may be included as enclosures.

f. Partial Report

(1) A partial report, prepared for printing, shall be submitted to COMOPTEVFOR by the prosecuting command upon completion of well defined parts, phases, or tasks of a project or if a final report on the entire project cannot be submitted within a reasonable period.

(2) A partial report is expected to stand as part of the completed record of the project, and the information contained in this report should not be repeated in the final report other than to summarize the major results, conclusions and recommendations. This summary shall be included in the "Previously Known Data" section of the final report.

(3) The content and format to be used in preparing a partial report are the same as for a final report. They are described in paragraphs 508 and 509.

(4) Partial reports shall be numbered in sequence for each project.

g. Final Report

(1) Upon completion of each Operational Evaluation, Concurrent Evaluation, Operational Assist, Operational Appraisal, and Fleet Operational Investigation, a proposed

final report, prepared for printing, shall be submitted to COMOPTEVFOR by the prosecuting command.

(2) If the project can be covered by a single report, that report will be a final report and shall indicate that the project is concluded.

(3) Although the data submitted in previous partial reports should not be duplicated in the final report, the body of the final report on a project, for which previous reports have been submitted, must be complete in itself. Data summaries and graphs are required to provide the logical and complete development of the final report and shall be included.

n. Supplementary Report.

A supplementary report shall be submitted under the following conditions:

(1) In those cases where additional significant results become available after the submission of the final report on a project, even though the project may have been canceled or terminated by CNO. This type of a supplementary report shall be prepared in letter form following the format for a progress report.

(2) For reporting additional tasks assigned by the Chief of Naval Operations after COMOPTEVFOR has submitted a final report on a project, or upon reactivation of a previously canceled or terminated project. This type of supplementary report shall be prepared for printing following the outline for a final report.

(3) In those cases where the information reported is of a higher classification than the final report. This type of report may be submitted either as a letter following the format for progress reports discussed in article 504, e.or, if of sufficient length, prepared for printing following the outline for the final report.

i. Reports on Technical Evaluations, Development Assist Tests, and Fleet Research Investigations.

Reports will be submitted to COMOPTEVFOR by the subordinate activity to which the project was reassigned by COMOPTEVFOR.

(1) Upon completion of the project, a report summarizing the assistance and services provided and containing a request that the project be terminated shall be submitted. Comments and recommendations which may have been previously specified will also be indicated.

(2) Upon assignment of an assist-type project, the cognizant Headquarters Division Director will screen the project to determine if it is of such importance as to warrant submission, to COMOPTEVFOR, of a summary report. It is recognized that some assist-type projects will not be of such importance. If a summary report is considered necessary, the requirement for its submission for its submission will be stated in the reassignment letter or message. This report will be submitted no later than 20 working days after completion of the project.

j. Reports on Tactical Procedures Incident to OPEVAL.

Tactical procedures for use of new or standard equipment, weapons and systems developed during the prosecution of Operational or Concurrent Evaluation Projects shall be prepared following the general outline format used in NWIP-1-4 or in the format of a change to the appropriate warfare publication or aircraft tactical manual. Although tactical procedures shall normally be forwarded to COMOPTEVFOR as enclosures to the reports submitted, the specific manner for their submission shall be stated in the project plan. The typing of tactical manual changes to formal reports tends to delay both the formal report and the submission of changes to a tactical manual. The method specified for the submission of tactical procedures should ensure early introduction into the Fleet and permit early changes or additions to existing manuals.

k. Development of Tactics. When a project requires the development of tactics as well as the evaluation of the tactics, the presentation of the tactics developed shall be written as in j.

(1) The tactical manual or proposed change shall normally be an enclosure to the basic report; however, the manner of submission will be specified in the project plan.

(2) No abstract of the presentation is required. However, the letter of transmittal shall explain briefly the function of the manual or proposed change.

Advance Evaluation Notes.

AEN's (Advance Evaluation Notes) are summaries of operational, training, or maintenance information concerning a weapon or support system, component, equipment or material under evaluation.

a. The purpose of the AEN is to provide timely operational, training, or maintenance information to Fleet units equipped or about to be equipped with a particular system or equipment. Thus the requirement for AEN's will exist in the following instances:

(1) When a weapon or support system, component, equipment, or material undergoing evaluation is already in the Fleet.

(2) When a weapon or support system, component, equipment, or material is nearly ready for Fleet introduction. Each project plan promulgated by COMOPTEVFOR will contain a statement as to whether AEN's will or will not be required.

b. Upon receipt of an Operational or Concurrent Evaluation assignment, the cognizant COMOPTEVFOR Staff Division Director, or DEPCOMOPTEVFORPAC, as appropriate, will review the assignment details and determine if the project warrants the promulgation of AEN's. If appropriate, the prosecuting command shall be informed of the frequency of submission of proposed AEN's in the project reassignment letter. AEN's will be prepared and distributed by the subordinate activity of OPTEVFOR conducting the evaluation.

They shall be identified by an appropriate title and number, and written in an informal, narrative style. AEN's shall contain only that information, obtained as a result of valid tests, which is considered to be of value to the Fleet for operational, training, or maintenance purposes. A discussion of the conduct of the test may be included when it contributes to a better understanding of the AEN. Conclusions and recommendations will not be included. Ordinarily, AEN's will contain only factual information; however, they may also contain opinions when such opinions pertain to employment methods, procedures, or operating techniques. Opinions which can be construed as pertaining to the acceptability of the system or equipment involved will not be included. Opinions will be clearly identified as such, and the basis on which they were reached will be indicated. Any information which would tend to support or limit the validity of the opinion will be included.

c. AEN's will be approved by a review board from the command originating the AEN. When such a board is convened, COMOPTEVFOR and/or DEPCOMOPTEVFORPAC and cognizant Fleet unit representation should be requested.

d. Commanding officers of prosecuting commands shall sign all AEN's or ensure that they are properly authenticated. AEN's will be distributed directly by the preparing activity. A copy will be forwarded to COMOPTEVFOR for information. Distribution of AEN's shall include Atlantic and Pacific

Fleet activities which have a need for early information on the project. Deployed Fleet commands and units, the cognizant office in CNO, and appropriate activities of the Naval Shore Establishment, such as NAVTACDOCACT and the technical agencies and laboratories having an interest in the project, shall also be included.

e. AEN's shall be reviewed semi-annually by the originating command in order to up-date, revise, or cancel them as appropriate.

Project Reports submitted by COMOPTEVFOR

a. Technical Evaluations and Development Assists.

When assistance specified in the project assignment has been provided, a letter report will be submitted to CNO by COMOPTEVFOR, with a copy to the agency for whom the services were furnished. The report will summarize the assistance provided and request termination of the project. The report will include comments and recommendations when specified in the assignment letter.

b. Operational Evaluations, Operational Appraisals and Fleet Operational Investigations.

Upon conclusion of an Operational Evaluation or Fleet Operational Investigation, COMOPTEVFOR will submit a report of the findings of such projects to CNO, with copies to appropirate activities. Interim reports shall be submitted as deemed necessary or as directed.

c. Concurrent Evaluation.

Upon conclusion of a Concurrent Evaluation, the developing agency and COMOPTEVFOR will submit reports to CNO.

(1) The developing agency's report will cover the technical aspects of the evaluation, as requested by the Chief of Naval Operations.

(2) COMOPTEVFOR's report will cover the operational aspects of the evaluation.

d. Operational Assist.

Upon conclusion of an Operational Assist COMOPTEVFOR will submit a report of the project to CNO and to the developing agency. The report will be limited to the results of the tests conducted.

e. Fleet Research Investigations

When the assistance specified in the project assignment has been provided, a report will be submitted to CNO by the Fleet Commander-in-Chief or by COMOPTEVFOR, as appropriate, with a copy to the agency for whom the services were furnished. The report will summarize the assistance provided and request termination of the project. The report will include comments and recommendations, if specified in the assignment letter.

f. Letter Extracts

Upon receipt by COMOPTEVFOR of reports which will be printed, a letter extract will be prepared by the appropriate Staff Division for forwarding to CNO. The letter extract will contain the abstract, major conclusions and major recommendations from the basic report and shall be limited to three pages. The extract will be routed within

the COMOPTEVFOR Staff with the report from which extracted. Ten copies of the extract report will be designated for the cognizant CNO Project Monitor by OP number, five copies to the cognizant systems command, and a copy to the prosecuting command.

Distribution of COMOPTEVFOR Project Reports

Distribution of COMOPTEVFOR project reports shall be governed by the current series of OPNAV Instructions 5510.1, 005510.48 and NAVMATINST 4000.17. As the distribution list varies from one report to another, cognizant Project Officer will prepare a realistic initial distribution list, assigning copies only to DOD agencies which have a relevant interest in the report. Fifteen copies only will be designated for CNO under the "Copy to" distribution, and the OP number of the CNO Project Monitor as designated in the assignment letter must be indicated. The CNO Project Monitor will make further required distribution within OPNAV. Other "Copy to" addressees shall be listed as specific individual addressees or by Standard Navy Distribution List numbers.

Composition of Evaluation Project Reports

The format to be employed in the preparation of evaluation project reports is designed to afford an orderly presentation of information, analysis, conclusions and recommendations. The form and content of progress, partial, final and supplementary project reports may vary depending

upon whether the report concerns equipment or tactics. the format prescribed, however, is not rigid. It is recognized that certain projects may be more effectively reported if the format is varied. Such variations may be approved by the Deputy Chief of Staff for Operations.

a. Any modifications or relocation of standard equipment or material shall be described in detail. Attachments such as photographs, diagrams or specifications should be used to reduce the length of descriptive details and ensure clarity.

b. When tests are conducted at testing grounds or areas, such areas shall be listed. When test results are reduced or evaluated by mechanical or electronic means, this fact should be mentioned in the report.

c. When recommending an equipment, system or component for service use, consider, and include in the report, any qualifications that HERO (hazards of electromagnetic radiation to ordnance) and other such tests performed in addition to OPTEVFOR tests may have revealed as a restriction, danger, hazard or limitation.

d. For all projects, include run-by-run listings or graphs of raw data, and a matrix presentation of variable combinations tested, with sample sizes for each combination. On complex projects involving reduction of large amounts of data, reports must include sufficient raw data to substantiate the results, conclusions and recommendations

drawn. If the supporting raw data is so unwieldy as to preclude enclosing it in the basic report, then, and only then, may it be enclosed in a separate "Data Supplement" to the basic report. This supplement shall be due 60 days after submission of the basic report. It shall be a printed and bound report, and the title shall refer to the basic report, i. e., "Data Supplement to Final Report on Project O/S 99, Evaluate the Terrier Weapons System in USS HUEY." The distribution of this data supplement will normally be restricted to those commands and activities directly concerned with the evaluation.

e. Photographs and other graphical presentations provide an excellent means for clarifying the report. The liberal use of such material to amplify the textual presentation is encouraged.

Glossary

AFWR	Atlantic Fleet Weapons Range
APL	Applied Physics Laboratory
AUTEC	Atlantic Undersea Test & Evaluation Center
CINCLANTFLT	Commander-in-Chief, U.S. Atlantic Fleet
CINCPACFLT	Commander-in-Chief, U.S. Pacific Fleet
CNO	Chief of Naval Operations
Com Des Dev Gru	Commander Destroyer Development Group
COMFAIR	Commander Fleet Air
Com Nav Air Lant	Commander Naval Air Forces, U.S. Atlantic Fleet
COMNAVBASE	Commander Naval Base
COMNAVORDSYSCOM	Commander Naval Ordnance Systems Command
COMOPTEVFOR	Commander Operational Test and Evaluation Force
Com Sub Dev Gru	Commander Submarine Development Group
Com Sub Flot	Commander Submarine Flotilla
D.A.	Developing Agency
DCNO (D)	Deputy Chief of Naval Operations (Development)
Eng Sta	Engineering Station
ET	Electronics Technician
ETR	Eastern Test Range
FMSAEG	Fleet Missile Support and Evaluation Group
JAX	Jacksonville
NAS	Naval Air Station
NAVMATCOM	Naval Material Command
NAVTACDOCACT	Navy Tactical Doctrine Activity

NLON	New London
NMC	Naval Missile Center
NOLTF	Naval Ordnance Laboratory Test Facility
NOTS	Naval Ordnance Test Station
NOU	Naval Ordnance Unit
NWS	Naval Weapons Station
OEG	Operations Evaluation Group
ONR	Office of Naval Research
OPCON	Operational Control
OPTEVFOR	Operational Test and Evaluation Force
PMR	Pacific Missile Range
QM	Quartermaster
RAV	Restricted Availability
RDT&E	Research, Development, Test and Evaluation
RM	Radioman
TAV	Tender Availability
Ty Com	Type Commander
USCG	United States Coast Guard
VACAPES	Virginia Capes
YN	Yeoman

MARINE CORPS OPERATIONAL TEST AND EVALUATION

The Marine Corps, wherever possible, utilizes the operational test results of the other Services. Equipments peculiar to the Marine Corps are tested and evaluated and the results are sent to the Commandant of the Marine Corps.

1. ORGANIZATION: The Marine Corps does not have within its R&D organization a unit that is dedicated solely to Operational Test & Evaluation (OT&E). The intent/objectives of OT&E are accomplished by other types of tests with the results utilized in the subsequent development/procurement decisions. In lieu of formalized OT&E tests, the Marine Corps employs expanded service tests, troop tests, and special operational evaluations. Tasking of Commanding General, Marine Corps Development and Education Command (CG, MCDEC) for these tests is done by Commandant of the Marine Corps (CMC) through the Deputy Chief of Staff (RD&S). The nature of the item or concept to be tested determines the designation of the participating units.

Without a formal OT&E command like the Navy's Operational Test & Evaluation Forces (OPTEVFOR) the Marine Corps is forced to use Fleet Marine Force (FMF) units for its tests. Within the Marine Corps Development and Education Command the Deputy for Development (Director, Development Center) develops test plans in concert with the FMF units involved. The scope of testing and resources required is dependent on the type of test and the nature of the equipment/concepts being tested. CG, MCDEC prepares the requisite test reports along with pertinent recommendations and submits them to CMC for approval.

In those joint programs where the Army, Air Force or Navy does the development and testing, the Marine Corps participates as required and provides appropriate resources (funds, personnel and equipment). When another Service has statutory responsibility for developmental action that also satisfies a Marine Corps requirement, the attendant OT&E is usually accepted by the Marine Corps as the basis for procurement. Variations in supply and maintenance, normally minor in nature, are resolved during the first year of use. For major items of equipment (aircraft, tanks, armored amphibians, weapons) the Marine Corps depends on the larger Services for the technical development, and in most cases the operational testing, with varying degrees of participation by the Marine Corps.

2. LINES OF COMMAND: (See Figure 1.)

3. FACILITIES AND ASSETS: The Marine Corps Development Center located at Quantico, Virginia, and subordinate to MCDEC, is the principal RDT&E field activity of the Marine Corps. A subordinate test facility located at Camp Pendleton, California, is designated the West Coast Test Branch, Mobility and Support Division, Development Center, MCDEC. The Quantico facilities possess limited assets relative to OT&E and are oriented primarily towards the administrative aspects of RD&S (e.g., conduct of studies, development of requirements documentation, supervision of Marine Corps sponsored R&D programs, supervision/coordination of joint R&D programs, monitoring of other Services' R&D programs and the development of tactical doctrines). Ranges and facilities are also available for limited service testing of equipment.

The West Coast Test Branch, located at Camp Pendleton, California, is oriented and equipped for the conduct of service tests on equipment peculiar to the Marine Corps and primarily for employment in the amphibious environment (ship to shore). Some testing of Army developed vehicles is performed for the purpose of determining their suitability for Marine Corps use in an amphibious environment. Minimum personnel and equipment resources are available at these facilities. As previously stated, the facilities and personnel of FMF units are utilized for many tests.

4. FUNDING: Funding requirements to support Marine Corps OT&E are routinely included in the total DON RDT&E appropriations as part of the project or element they are to support. There is no specific Program Element dedicated to OT&E. Upon approval and apportionment to the Marine Corps of requested program funds, a similar apportionment of necessary funds is provided to the CG, MCDEC to support service and troop tests. MCDEC requirements are based on an annual budget request from that facility.

5. SCOPE OF TESTING: As previously explained, in lieu of formalized OT&E tests, the Marine Corps employs expanded service tests, troop tests and special operational evaluations. The scope of these tests include, but are not limited to, the following specific determinations:

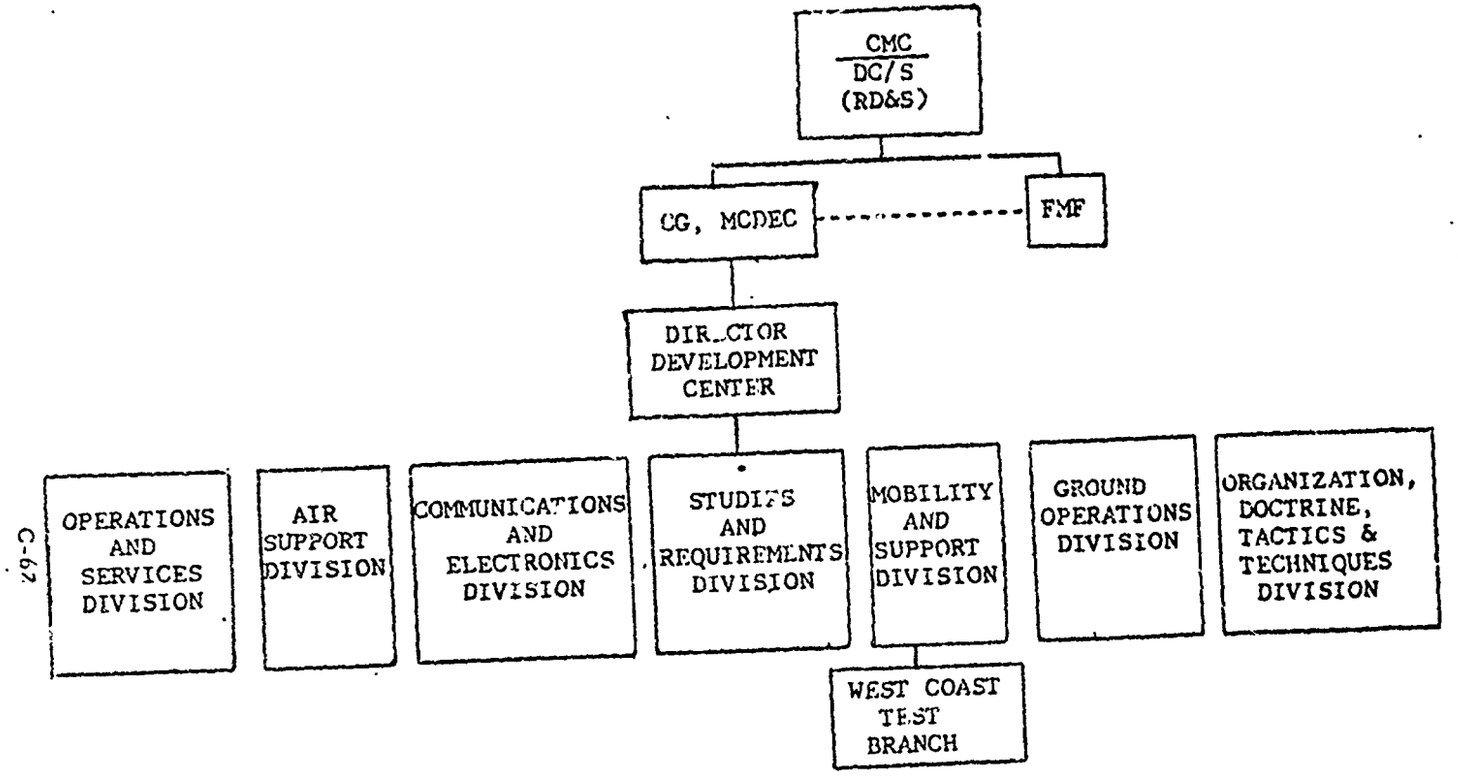

CMC
DC/S
(RD&S)
CG, MCDEC
FMF
DIRECTOR
DEVELOPMENT
CENTER
OPERATIONS AND SERVICES DIVISION
AIR SUPPORT DIVISION
COMMUNICATIONS AND ELECTRONICS DIVISION
STUDIES AND REQUIREMENTS DIVISION
MOBILITY AND SUPPORT DIVISION
GROUND OPERATIONS DIVISION
ORGANIZATION, DOCTRINE, TACTICS & TECHNIQUES DIVISION
WEST COAST TEST BRANCH

Figure 1

a. Durability - Provides data relative to failure rates, human engineering factors and operational cost.

b. Maintainability - Provides data relative to the maintenance time required to support the vehicle for a certain period of operational time.

c. Fuel and Oil Consumption - Provides data relative to the tactical considerations of operating range and battlefield day capability and operational costs.

d. Stowage - Provides data relative to stowage arrangement of On Vehicle Equipment (OVE) and the cargo handling and securing provisions (where appropriate).

e. Kit Evaluation - Provides data relative to the installation and functional aspects of various kits (where appropriate).

f. Compatibility with Amphibious Shipping - Provides data relative to compatibility of equipment with the various types of amphibious ships/crafts utilized in amphibious operations.

g. Troop Tests - Provides data relative to required design changes prior to initiating procurement, Tables of Organization and Equipment, and tactics and techniques.

h. Special Operational Evaluations - Provides data relative to the operational potential/feasibility of commercially developed equipment prior to initiation of procurement.

6. TEST REPORTS AND DISTRIBUTION:

a. Formal reports are prepared by the CG, MCDEC on all assigned test projects and submitted to CMC for review and approval. In the case of short-termed projects, a final report is submitted at the completion of required testing; however, in the case of extended projects, interim progress reports are submitted periodically with a final report upon completion of overall test objectives.

b. Distribution of reports is made to CMC, major FMF commands, Navy Amphibious Fleet Headquarters, U.S. Army Commodity Command Headquarters, U.S. Air Force TAC Headquarters, Navy Systems Commands (where pertinent), all Marine Corps Liaison Officers located with other Services and Defense Documentation Center.

APPENDIX D

OPERATIONAL TESTING AND EVALUATION

IN THE U.S. AIR FORCE

INTRODUCTION

This Appendix is devoted to an overview of Operational Testing and Evaluation as it functions in the Air Force. Included are a brief account of the relatively short history of OT&E in the USAF, a few words on the current organization responsible for OT&E at Air Staff level, and a description of the Air Force testing cycle and the types of test of which it is composed. As will be seen, the doctrine and methodology of OT&E in the Air Force has resulted from an evolutionary process, seldom static but continually endeavoring to be responsive to user needs.

HISTORY OF AIR FORCE TESTING

The early history of Air Force OT&E, or for that matter, any type of evaluation except laboratory testing, centers around the organizations and facilities at Eglin AFB. In 1934, the Baker Board recommended the creation within the Army Air Corps of a "Separate Branch for Research and Flight Testing." The Chief of Air Corps in 1939 approved consideration of an area at and near what is now the Eglin AFB complex in which the proposed Air Corps proving ground would be located. The geographical features of the area, plus the fact that a large part of it was already Government-owned land (the Choctawhatchee National Forest) dictated serious attention to its consideration. After considerable development study, the Air Corps Proving Ground was established with headquarters at Eglin Field in May 1941.

The Proving Ground contained, in addition to administrative functions, a Proof Department physically stationed at Maxwell Field, Alabama, to plan test programs and facilities and to analyze test results. The Proving Ground Detachment at Eglin was organized to conduct tests related to flying. The Air Corps Board, the President of which was also Commanding Officer of Eglin Field, was intended to be an operational control agency, composed of a relatively small group of highly qualified personnel whose primary job was to conduct specialized studies and give guidance to test activities.

Jurisdictional differences over control of Eglin Field and the Choctawhatchee National Forest delayed real progress until March 1942, when reorganization of the Army Air Forces resulted in a redesignation as the Air Corps Proving Ground Command. By early 1943, however, the Proving Ground Command had expanded its functions to include ordnance detachments at Aberdeen, Maryland; Edgewood Arsenal, Maryland; Madison, Indiana; and Hope, Arkansas; an electronics proving ground at Florosa, Alabama; and an Arctic, Desert, and Tropic Information Center.

In the meantime, an AAF School of Applied Tactics had been established to test the tactical suitability of equipment which the Proving Ground had found to meet military requirements (operationally suitable). Interface between these two agencies was defined by a directive issued in April 1943 by General Arnold.

Between 1943 and early 1946, the AAF Proving Ground Command became a satellite of the Army Air Forces Center, added four detachments, activated an experimental guided missile group, and had replaced the AAF center at Orlando Army Air Base, with the activity at Eglin reverting to subordinate status. In July 1946, the AAF Proving Ground Command was redesignated the Air Proving Ground Command with headquarters at Eglin. Following a series of internal organizational changes in the next two years, the APGC was transferred to the Air Materiel Command and for six months in 1948 was known as the Air Materiel Proving Ground. In June 1948, it reverted to its former status as the Air Proving Ground Command.

The Command's mission remained essentially the same throughout the next ten years, although changes in internal organizational structure were made from time to time. Essentially, the Air Proving Ground Command served as an independent testing agency for the Air Force to assess the Product of the developer as to its "operational suitability." Personnel with operational experience manned its testing organization (3200th Proof Test Group) and tests were designed and conducted to evaluate systems and subsystems in an environment as close to operational as could be simulated. Occasionally, support from the using commands was obtained in the form of personnel and equipment which were then included in realistic simulations of combat operations. The development of tactics and techniques for operational employment was made a part of each test when and wherever possible. In short, APGC served in a role as unbiased as could be established between the developer and the user.

The findings of APGC tests were not always welcomed by the using commands, since the latter were of the opinion that they were in a better position to evaluate an item in the environment in which it would ultimately be employed. As a counter to this, however, it could be, and often was, maintained that the Air Proving Ground Command was better fitted to produce quantified data which were valuable in decision-making or in precise evaluations of a system's suitability.

In late 1957, the decision was made by Headquarters, USAF, to place APGC under the cognizance of the Air Force Research and Development Command in a center status, combined with the Air Force Armament Center which was by then also a tenant on Eglin AFB. This

action gave APGC a new mission, oriented toward development. It retains that function today under the Air Force Systems Command. Now designated the Armament Development and Test Center (ADTC), it shares the Eglin facility with the Tactical Air Warfare Center and the Special Operations Force (both of the Tactical Air Command).

ADTC, although it is by mission development-oriented, has supported numbers of Category I.I (OT&E) tests under the pressures of the Southeast Asia effort simply because no other Air Force facility is now capable of getting the kinds and amounts of quantitative data needed. Some compromises with realism have been made in these cases because of lack of air and land space to support required combat-type flight regimes in a credible threat environment.

In 1958 responsibility for planning, funding and conducting the Air Force OT&E function reverted to the operating commands. It is there today, defined in AF Regulations 80-14 and 55-31. The internal organization to implement it varies among the commands; i.e., the five test centers of Tactical Air Command, the Air Defense Command activity at Tyndall AFB and the Strategic Air Command missile test effort at Vandenberg AFB, as examples. Interface with the Air Staff on OT&E matters is provided by the organization described immediately following.

AIR STAFF ORGANIZATION FOR OT&E

As a result of several in-house studies on the conduct and management of Air Force weapons effectiveness testing in the 1963-64 period it became apparent that a focal point within the Air Staff was needed to provide centralized guidance and direction to an admittedly fragmented service-wide effort. An ad hoc committee, headed by Brigadier General K. C. Dempster, in November 1964 recommended the establishment of such a function within the Air Staff which would, in addition to providing the needed control, determine data requirements, set up a priorities system, provide testing resources, insure their economical utilization, and assure the timely processing and distribution of test results. The philosophy of de-centralization of responsibility for test design, methodologies, and actual conduct was to be retained, with Air Force Systems Command responsible for Categories I and II of acquisition testing (R&D oriented) and the using organization performing and reporting on operational tests and evaluations (Category III and onward). Nuclear weapon tests were specifically excluded.

The recommendations of the Dempster committee report were implemented in an Air Force Chief of Staff directive in November 1964 and a letter in December 1964 which established an interim Weapons Effectiveness Testing Task Force under the Directorate of Operational Requirements in the Air Staff. The resulting Office of Primary Responsibility for AFWET was reassigned to the Directorate of Operations, Deputy Chief of Staff, Plans and Operations in May 1965 as the Deputy Director for Air Force Weapons Effectiveness Testing. In August 1965, its charter was clarified and redefined in a Vice Chief of Staff letter to the major Air Force commands. Among its assigned responsibilities was the preparation of an Air Force regulation governing operational tests. Responsibilities for strategic ballistic missiles, nuclear weapons, and space systems were specifically omitted. Original manning authorization was for twenty-four manpower spaces, headed by a Brigadier General.

In July 1965, the organization's name was changed to Deputy Director of Operations for Operational Test and Evaluation and its manning authorization was increased to a total of sixty. As originally configured, the activity was composed of a Programs and Resources Group and four Divisions - Acquisition Test, Employment Test, Electronics Warfare Test, and Theater Air Base Vulnerability Test.

In the time between its establishment and the present, the organization has undergone various minor internal structural changes, none of which has had appreciable influence on the basic charter and mission under which it was activated. It is now composed of (1) an Operational Test Division, charged with monitorship of Category I and Category II testing, as well as planning, policy-making, and executive management of Air Force OT&E programs and (2) a Test Support Division, which provides scientific guidance in the design and analysis of tests, test resources, an Air Force OT&E priority system, and allied functions.

The present "Deputy for" operates as the Air Staff office of primary responsibility for all matters involving Headquarters, USAF, participation in or support of Air Force OT&E. A more detailed description of its mission and organic structure appears in an attachment to this Appendix.

THE AIR FORCE TESTING CYCLE

The present Air Force method of conducting OT&E is to have it done by the organization which will ultimately employ the weapons system, subsystem or component in the accomplishment of its assigned mission. As provided for in Air Force Regulations 80-14 and 55-31, the principal components of the complete testing cycle are:

Acquisition Testing

Category I Tests. There are development tests and evaluations of the individual components, subsystems, and, in certain cases a complete system under control of the Air Force Systems Command. In addition to qualification, this category provides for redesign, refinement, and re-evaluation as necessary including the practicability of using current standard and commercial items. These tests are conducted principally by the contractor, but with the Air Force (AFSC, using commands, and support commands) active participation, evaluation and control.

Category II Tests. There are development tests and evaluations spanning the integration of subsystems into a complete system in as near an operational configuration as practicable under control of Air Force Systems Command. Suitable instrumentation is employed to determine the functional capability and compatibility of subsystems. Category II is an Air Force effort with contractor participation, under Air Force (AFSC) control and direction, and with active operating and supporting command participation. Actual test operation and maintenance is performed by military personnel who have received formal system training.

Category III Tests. These are tests and evaluations of operational systems by the appropriate operating command. They include, insofar as possible, test systems which incorporate production components and support items and which are operated using realistically available personnel skills and technical data. They are performed under conditions as near-operational as practicable. Category III testing is conducted using a system configuration jointly agreed upon by Air Force Systems Command and Air Force Logistics Command. It is

the first class of testing in the cycle that can be characterized as OT&E. It is done in accordance with a specific test plan. It is terminated when pre-planned objectives of the acquisition plan have been met.

Category III Equivalent Tests. These are tests and evaluations of subsystems, armament, and equipment under control and direction of the operating commands. They have the same objectives as Category III tests for complete systems and are subject to the same constraints and philosophy.

Follow-On Development Tests. Systems, subsystems, armament, and equipment are given development tests and evaluations as required after completion of Category II tests. These R&D tests are used to evaluate corrections of deficiencies previously uncovered and improvements in systems not accomplished during the normal acquisition cycle testing.

Operational Employment Testing

Employment Tests. This is pure OT&E. It is conducted by the user or operating command to improve capability or to evaluate the extent to which the new weapon system will enhance the mission capability of the operator. It is designed to develop tactics and techniques for the most effective weapon usage, define operational problems and support new requirements and modifications. It exposes the new system or subsystem to an environment as realistically operational as practicable, employing only the support situation, personnel skills, and threat environment (if possible) which the test item can be expected to encounter. Realism in the evaluation process is enhanced wherever possible by the use of production items in statistically reasonable numbers.

Operational Evaluations. These are analyses and evaluations of operational data already available to minimize the costs in time and money of actual physical test. The product of these assessments may be used as a datum which physical test may use as a point of departure or as actual bases for conclusions and decision-making.

Strategic Ballistic Missile Systems Testing

Category I and II Tests. These are similar in objectives, scope, and conduct to the Category I and II tests of orthodox aircraft weapon

systems, subsystems and components. They are predominantly contractor efforts, with increasing military participation leading to the demonstration that system design goals have been met under non-operational conditions.

Demonstration and Shakedown (DASO) Tests. This is an evaluation equivalent to Category III tests of other systems. It is conducted by the operating command, assisted by the agency having Air Force engineering responsibility in an operational environment using operational procedures. It is intended to refine operational and logistic procedures, demonstrate basic system capabilities and limitations, and determine system stability for its intended mission.

Ballistic Missile Operational Tests. These tests expose the system to an environment as nearly operational as possible to evaluate reliability and accuracy under realistic conditions. They are true OT&E and are conducted in two phases: Phase I, a basic program of a fixed number of launches, and Phase II, an extension of Phase I, but consisting of a much smaller number of launches, allocated at an annual fire-out rate.

Electronic Warfare Effectiveness Tests

These are operational tests, not only of Electronic Warfare systems and their supporting subsystems but of the tactics and techniques which will maximize their effectiveness against threat EW operations and systems.

Weapon System Evaluation Program (WSEP)

This is a continuing weapons firing program to exercise and evaluate operational aircraft delivery systems and weapons to determine reliability and effectiveness. It is designed to provide continuity of weapon system effectiveness data by obtaining and evaluating, under a single program, compatible data from OT&E sources. The programs are conducted by the using commands under conditions and environments representative of the projected threat. They impact on such areas as indicated requirements for changes in training, tactics, manning, logistics support, maintenance and modification of existing hardware.

DEPUTY DIRECTOR FOR OPERATIONAL TEST & EVALUATION

I. RESPONSIBILITIES

Is responsible to the Director of Operations for planning, directing and evaluation the Air Force Operational Test and Evaluation (OT&E, Program.

II. FUNCTIONS

A. Operational Test Division (AFXOWQ)

1. Develops and/or reviews Category III and other operational test requirements, schedules, and support.

2. Develops, prepares and issues operational test directives.

3. Reviews and approves operational test plans.

4. Coordinates with commands and monitors operational tests.

5. Establishes and/or approves operational testing milestones and program changes.

6. Identifies and makes recommendations for operational testing resources and priority requirements.

7. Reviews and approves operational test reports and establishes reports distribution.

8. Through test and evaluation, develops criteria and provides interface and expertise for the deployment and initial employment of new systems, equipment and munitions.

9. Provides interface and takes action with respect to Directorate positions on systems, equipment, and munitions during all phases of the acquisition cycle.

10. Reviews and keep abreast of new research and development programs.

11. Monitors Category I and Category II testing connected with new equipment and systems being acquired to satisfy operational requirements.

12. Provides chairman for Tri-Service Group on EW Testing Resources.

B. Test Support Division (AFXOWG)

1. Performs research and studies required to validate new operational test requirements.

2. Studies operational problems and recommends test objectives.

3. Provides guidance and direction in scientific design of tests. Validates mathematical models and computer programs for test programs.

4. Provides scientific guidance and coordinates operational test directives; performs quantitative analysis of test results and data; and develops test methodology and procedures for improving test methods and concepts.

5. Develops Air Force test management and documentation system. Plans and provides guidance for management of data management system.

6. Conducts operational evaluations and analysis of technological advancements and determines operational applications to current and future systems, equipment and munitions.

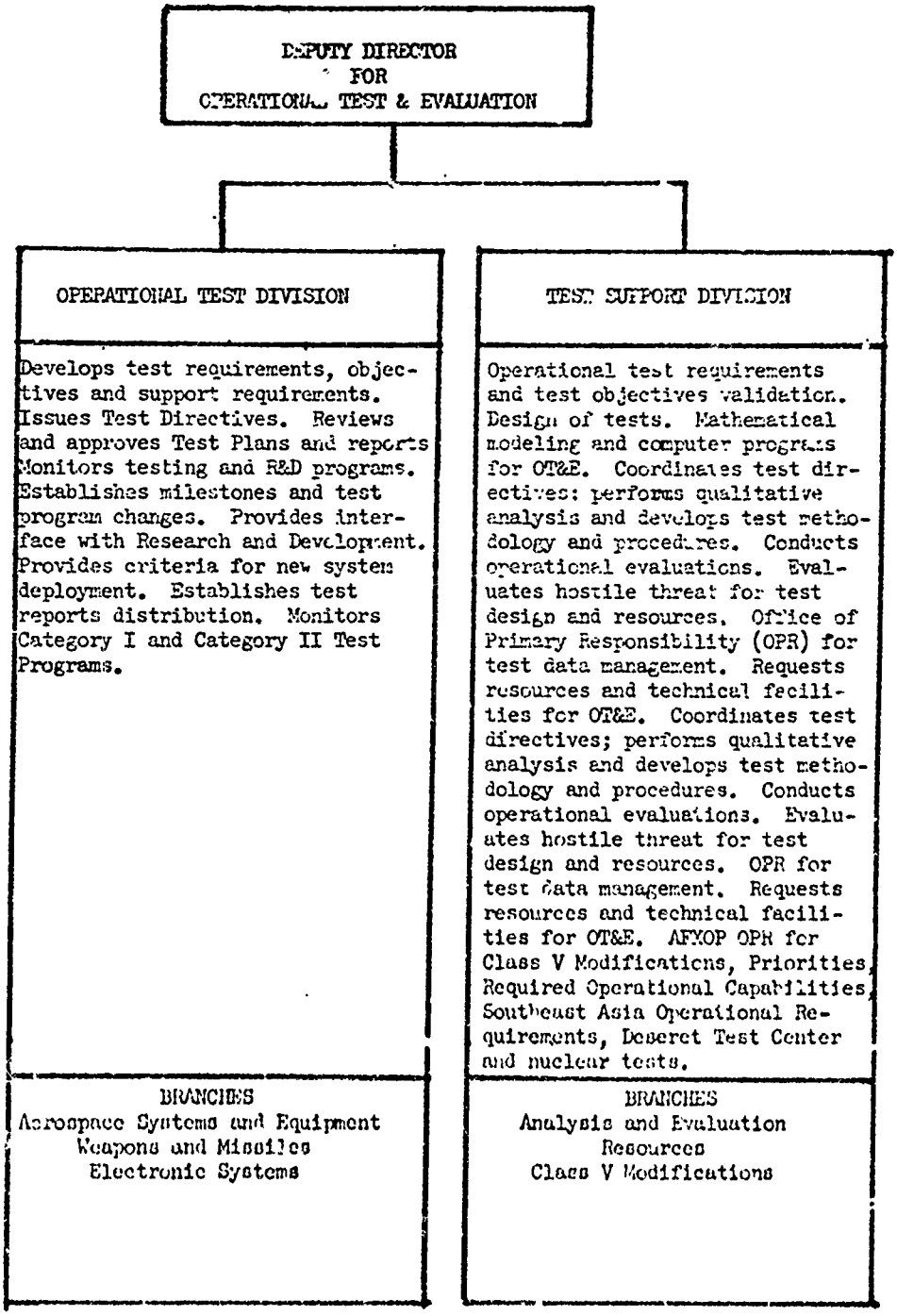
7. Conducts analytical studies of Air Force operational tests and problems. Analyzes and evaluates hostile threat for use in test design and identification of resources for testing.

8. Maintains data system on selected DOD resources and technical facilities for use in Air Force testing. Requests, monitors and takes actions leading to acquisition of resources and new technical facilities for Air Force OT&E.

9. Develops and manages a priority system for Air Force OT&E regulations and other publications.

10. Serves as Directorate Office of Primary Responsibility (OPR) for Class V Modification Program, and Required Operational Capabilities (ROCs). Serves as Air Staff OPR for Allocation Priorities of Unit Resources.

11. Serves as Air Staff OPR on matters concerning the Deseret Test Center. Maintains liaison with Defense Atomic Support Agency on Nuclear Weapons Testing matters and with the other Services and DOD on weapons testing.



APPENDIX E

SUMMARY OF

DISCUSSIONS WITH SELECTED

OT&E PERSONNEL

INTRODUCTION

In an effort to gain more insight into OT&E, the staff selected approximately sixty military and civilian personnel to interview on the subject. These individuals were chosen on the basis of their known extensive backgrounds in testing or because of the present positions they were filling in a test facility or staff. The level of these individuals ranged through pilots flying OT&E missions in evaluation squadrons, heads of test facilities and ranges, high-level civilians in civil service testing jobs, members of civilian industry staffs, and deputies of Service RDT&E programs. A complete list of personnel is shown in Inclosure 1.

Some of these interviews took the form of a briefing on their facility and/or the way they conducted OT&E, followed by a general discussion period. Others were strictly a round-table type discussion.

In order to insure coverage of some of the basic issues, a standard list of questions was prepared in advance as a starting point for the discussion. It was stressed that this was an informal discussion, and no answers would be identified with any individual. The answers that were solicited were not the official Service positions but the true feelings of the individual, based upon his extensive experience in the testing field.

1. Do you believe that there is a need to change Defense Department policy and organization to insure the conduct of more productive operational tests?

2. Do you think there is a requirement for an OT&E organization at higher than Service level? If so, what should be the scope of its responsibilities?

Within the Services, the large majority of individuals interviewed did not see any need for major change in Defense Department policy and organization relative to OT&E. The responses indicated general satisfaction with the function within each Service, and most importantly, with the capability of the Service to satisfactorily come to grips with its own OT&E problems. The prevalent opinion is that the Service

itself is much better able to cope with operational matters; to elevate major OT&E responsibilities to OSD would only further remove decision making from reality and result in significant delays in decisions.

Several persons, in particular some external to the Services, advocated for significant change to OSD policy and organizations. The arguments here varied - some felt a large activity (Deputy Assistant Secretary of Defense for OT&E) was necessary while others specified smaller but potent activities within the current DDR&E or Systems Analysis structures.

A key point raised was the nature of responsibilities of any OSD activity. Most interviewees saw little objection to some OT&E function at the OSD level. The Services tend to look on such an activity as one that would monitor Service OT&E, be helpful in obtaining funds and facilities, and perhaps occasionally refereeing (or suggesting) OT&E activities that involve more than one Service. However, any OSD function to direct and control OT&E was almost universally rejected as inherently unresponsive and a potential negative force on OT&E effectiveness.

The most reasonable and productive function for an OSD OT&E activity was considered to be the establishment of overall general policy and perhaps framing the pertinent questions about capabilities that would assist Services in developing their OT&E to also respond to valid OSD information requirements.

As concerns OT&E policy and organization within each Service, interviewees generally felt that his own Service's way of accomplishing OT&E was reasonable and responsive. Service OT&E organizations vary. The Navy places OT&E responsibilities in an independent organization (neither developer or user) reporting directly to the Chief of Naval Operations. The Army has an independent materiel-oriented OT&E activity under the developer organizationally, but reporting directly to the Chief of Staff. Other OT&E in the Army, test and evaluation of operational and organizational concepts, is done by an agency which represents the user and also reports directly to the Chief of Staff. The Air Force has OT&E a user responsibility. As a result of these differences, the question of independence and

reporting level for Service OT&E was much discussed. The general opinion was the separation of OT&E from the developer was necessary. Opinion on degree of user responsibility and participation varied; however, the need for trained, knowledgeable and motivated working level OT&E personnel was considered more important than organization. There was some support for an independent OT&E activity within the Air Force and reporting to the Chief of Staff. However, Air Force experience with the Air Proving Ground Command was fresh enough so that the creation of an identical activity - large and cumbersome - was not considered appropriate.

3. How should OT&E be funded?

Provide a level of effort funding to take care of housekeeping and indirect labor. Program managers should budget and fund for direct labor costs of their testing programs and for any special instrumentation required to carry out the tests. Procurement funds should be used where an item is consumed by the test. Example - missiles.

It is felt that funding should be consistent between the Services and ranges. Customers are forced to use range facilities that are free to them versus ranges that are industrially funded even though the overall cost to the Government might be more. Industrial funding tends to make facilities cut overhead costs to a minimum; however, on the other hand, it tends to make the program manager cut his test program below the optimum level because of the cost.

The general consensus was that OT&E was receiving adequate funds now for the type of OT&E being conducted considering budget constraints. However, if OT&E should be undertaken on the scale envisioned by the PSAC report, a considerable increase in the T&E budget would be required.

4. Should production other than prototype be contracted before completion of OT&E?

This question is influenced by many other factors. A weapon system like a fighter aircraft will be used here as an example. The basic design of the F-4 aircraft was submitted in 1953, and the first contract was signed in 1954. The aircraft was first introduced to an

operational squadron in 1960. The present replacement for the F-4 is the F-14, which should be finishing operational testing about 1975. If the decision is made to go into limited production after first flight in 1971, the aircraft would get to the fleet in limited numbers in 1975, or twenty-two years after the F-4 was conceived.

If the decision is made to test before buy, and after testing in 1975 the F-14 does not come up to expectations, it would take an additional seven years minimum to get another system up to this point. The F-4 would then be twenty-nine years old and would have been unable to meet the Russian threat for many years. In other words, when you do not have a new prototype coming along every two - three years, you are more or less locked in to making the new system work because it is better than what you have. If you have several weapon systems in R&D spaced properly, you can afford to go slower, do more thorough testing, and undoubtedly get a better product.

The general consensus of those interviewed was that under the present system, it is too costly on major systems not to contract for some production models prior to completion of testing.

5. For a major weapon system, how many test vehicles are required for a thorough test program?

For aircraft and tanks, six-to-eight would be the minimum number for Operational Evaluation only. For the complete test program through Operational Evaluation, the numbers should be on the order of sixteen to twenty. For other items such as a major item of complex electronics equipment, the number can be as low as two. It was evident that the particular weapon system being tested determined the number needed. Most people felt that test items for Operational Evaluation should be manufactured with production-line tooling since production-line techniques will result in a different product than R&D techniques.

6. What are your thoughts on test ranges and their control - national ranges, Service ranges, contractor ranges, methods of funding, methods of scheduling?

Responses to this question varied somewhat according to the Service affiliation of the interviewee. In general, U.S. Army personnel considered their facilities adequate for OT&E (Service Testing in the

Army) as did U.S. Navy personnel. U.S. Air Force responses indicated general satisfaction with R&D test facilities/capabilities but also cited OT&E ranges as limited in proper scope and instrumentation. In this regard, the Air Force-proposed concept for an extensive capability to conduct integrated offensive-defensive OT&E with sizable numbers of airborne systems in conjunction with realistic simulated threat situations (the HAVE EDGE study) was the subject of some comment. Although such a capability was considered ideal and certainly of far-reaching potential for needed mission-oriented OT&E, not all agreed that the concept was feasible within the present state-of-the-art of instrumentation or ability to construct an inclusive and realistically flexible threat environment.

A serious problem of concern to most interviewees, regardless of Service, is the slow but continuing encroachment on range space and facilities by civilian communities, civil air desires, natural resource exploitation interests, and other interest groups within and outside of the Government. Many ranges have lost some flexibility to do comprehensive OT&E due to flight restrictions.

In general, scheduling of Service ranges is not considered a major problem. Each Service feels its ability to control its ranges is essential for responsiveness. In addition, utilization of other Service ranges when necessary is not considered a major problem. Scheduling and reimbursement procedures are adequate and reasonably responsive.

The need for national range resources is generally appreciated; however, these should be limited to those unique and costly resources of common use to all Service needs.

Funding of ranges was the subject of extensive comment. Funding methods and procedures vary between and within the Services. Most felt that the Services should have the same type funding procedures. The majority opinion was for some level of effort Service funding as the best means of preventing loss of capability. However, there was some support for industrial funding as the best way to force planning and eliminate inefficiencies.

Separate funding for OT&E (as a program element) was given some support. Identification of OT&E fund requirements by project was considered beneficial - particularly when the project required new facilities/capabilities.

7. What kinds of actual combat experience are amenable to evaluations as contrasted with formal OT&E?

The majority of the respondents to this question were of the opinion that actual combat experience has limited value as a source of operational data. The main reasons given for this consensus was that the lack of control over the situation in combat resulted in data of unknown validity. Some data such as that pertaining to maintenance, logistics, sorties flown or ordnance delivered can be accurately recorded, but data concerning effectiveness cannot be acquired with any degree of assurance regarding its validity.

8. Define Operational Testing and Evaluation.

There was no general agreement among the respondents as to a precise definition of Operational Testing and Evaluation The most frequently mentioned elements of OT&E were operational environment (actual and simulated), typical user personnel and operationally configured systems (prototype or early production models). Purposes mentioned for OT&E ranged from determining the suitability of newly developed systems to developing new uses for old systems. The following definition is a distillation of the majority of the responses to this question: a test conducted under actual or simulated operational conditions to determine the suitability of an item to accomplish its intended function; the best way to employ an item; or modifications needed to make a system more useful.

Some respondents indicated that in their opinion operational evaluation precedes the development of requirements and that subsequent operational testing constitutes only one of many inputs to continued operational evaluation. Several responses included comments to the effect that OT&E continues throughout the life of a system.

9. Can OT&E be used in the decision-making process? If so, how?

The majority of the respondents were of the opinion that the results of OT&E must be considered in production decisions. A significant minority maintained that OT&E cannot be realistically accomplished until production models are available and that OT&E cannot therefore provide input to a decision to produce. In recognition of this minority position, several respondents indicated a belief that production should be limited until OT&E is complete. Others felt that OT&E of prototypes or R&D models would suffice as a basis for decisions to produce a system in quantity.

10. How does the quality of OT&E now compare to similar efforts of a decade or more ago?

How does it compare with what is needed?

There appeared to be substantial agreement among those responding to this question that OT&E is better now than in the past; however, there was a recognition that there is still a great deal of room for further improvement. Areas requiring improvement were the use of more precise analysis of results, more use of computer simulations as an assist to analysis, and the development of a higher degree of testing expertise within the Services.

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APPENDIX F

OT&E CASE HISTORIES

Selected Operational Tests

and

System Development Programs

CONTENTS

*Not included here because of security classification. They were published separately and made available to the Blue Ribbon Defense Panel and its staff.

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INTRODUCTION

Among the specific study tasks which the OT&E Task Group undertook was documentation of selected represented OT&E efforts. The results of this undertaking are presented in this Appendix in the form of case histories. These case histories include both specific operational tests and also development programs with OT&E activities and their influence (or lack thereof) noted and discussed. It is believed that studying these case histories will yield insight into the characteristics of both successful and unsuccessful OT&E and will also point the way to actions which are required to make OT&E play a more important role in placing effective weapon systems and materiel in the hands of the operational forces.

Detailed comments on specific testing are found in the individual case histories. It should be pointed out, however, that there is a difference between "good" operational testing and "effective" operational testing. For OT&E to be effective, its results must be communicated to the proper level and acted upon. There is considerable evidence that such communication and subsequent action represent weak links in the overall system. For this reason, it is evident that much "good" OT&E has not been "effective" OT&E.

TEST HISTORY OF THE M551 (SHERIDAN/SHILLELAGH) WEAPONS SYSTEM AS IT RELATES TO MAJOR DECISIONS

Background

The M551 weapons system has been the subject of intensive investigation by Congress and the General Accounting Office. One result of this investigation has been an allegation that the system was not adequately tested prior to its full scale procurement.

Discussion

The requirement for an Armored Reconnaissance Airborne Assault Vehicle weapons system was approved in 1959. This requirement identified the need for an armored vehicle to function as the main reconnaissance weapon for armor, infantry and airborne operations, and as the main assault weapon for airborne operations and combined arms teams not employing the main battle tank. The vehicle was to possess a high degree of cross-country mobility, have an inherent swimming capability, and be air transportable and air droppable. The vehicle was to replace the M56 Self-Propelled Anti-Tank (SPAT) Weapon and the M41 tank. The M551 weapons system was developed to satisfy this requirement.

The design which was adopted for development entailed high risks in several areas including the gun-launcher through which both conventional ammunition and the guided missile could be fired; the anti-tank guided missile itself; the combustible cartridge case for the conventional ammunition for the main armament; the night-firing system; and the making of a tank-like vehicle which could swim and be parachuted from aircraft. While all of these features had been the subject of previous R&D efforts, none of them had been proven in prior operational systems.

By early 1964, the first pilot models (prototype) had been assembled and delivered to the U.S. Army Test and Evaluation Command (TECOM) for Engineering Test (determination as to whether the manufacturer has met the stated specifications) and Service Test (determination of suitability for U.S. Army use).

The Service Test, the first operational test to which a new system is subjected, revealed ninety-eight deficiencies[1/] and one hundred twenty-six shortcomings[2/] and resulted in the waiver of three unachievable requirements which were included in the approved military characteristics for the system. The final report of this test contained a conclusion that the M551 was not suitable for U.S. Army use until the deficiencies and shortcomings had been corrected. While the Service Test was underway, action had been taken to type classify the M551 for limited production, and a multi-year production contract had been awarded. The system was type classified Standard A[3/] in May 1966, approximately six months after the completion of the Service Test. (Inclosure 1 presents a graphic relationship between tests and decisions.) This testing of pilot models continued with climatic tests in desert and arctic environments.

In late 1966, five early production M551s were delivered to the U.S. Army Test and Evaluation Command's Armor and Engineer Board for Confirmatory Test. During this test, representative crews were exercised in a simulated combat environment in a manner designed to test all components of the M551. The final report of this test indicated that of the ninety-eight deficiencies found in the Service Test, forty-five had not been corrected in the production models and that of one hundred twenty-six shortcomings previously found, forty-seven had not been corrected. This Confirmatory Test additionally revealed one hundred

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1/ Deficiency - A deficiency normally disables or immobilizes the equipment; and if occurring during test phases, will serve as a bar to type classification action.

2/ Shortcoming - Will not cause an immediate breakdown, jeopardize safe operation, or materially reduce the useability of the item. If occurring during test phases, should be corrected if it can be done without unduly complicating the item or inducing another undesirable characteristic such as increased cost, etc.

3/ Standard A - A preferred and fully acceptable item which has successfully completed all required test and evaluation, meets DA approved requirements, military characteristics, and specifications for worldwide or specified geographic areas, is totally suitable for performing the required mission, can be properly maintained and logistically supported in the area or environment in which the item is to be used, and is being or can be produced in quantity.

fourteen new deficiencies and one hundred twenty-eight new shortcomings. This test report also indicated that of the eighty-two requirements subjected to measurement in this test which were included in the approved military characteristics for the system, sixty-five were met or exceeded by the test items. The most important area of failure to meet the criteria of operational suitability was the conventional ammunition.

The operational testing and evaluation of this system continued for the ensuing three years in the form of climatic tests, check tests, confirmatory tests, product improvement tests, and troop tests. Many of these later tests used either pilot or early production models which had not yet been modified to correct the known deficiencies and consequently old deficiencies were rediscovered and some new ones were identified.

Based on test results, various modifications to the system have been developed, and retrofit programs have been initiated to provide vehicles which are suitable for U.S. Army use.

Modified systems have been deployed to some U.S. Army units in the continental U.S., Vietnam, Europe and Korea. The CONUS unit participated in a U.S. Army Combat Developments Command Troop Test of A Light Armor Battalion. While this test was designed to evaluate the organization and doctrine for the test unit, there were some side evaluations of M551 operational suitability. The deficiencies revealed by this test had been previously discovered by the TECOM tests. One significant modification was recommended - the addition of a range finder for use when firing conventional main gun ammunition. This recommendation was based on an unacceptably low percent of first round hits during the test. Using commands in both Vietnam and Europe were asked to conduct evaluations of the M551 when initial deployments were completed. The deficiencies found in each theater had been identified by previous TECOM tests. Coincidentally, each theater reinforced the CONUS recommendation concerning adding a range finder. Other modifications, peculiar to the environment in each theater of operations, were recommended.

Analysis

The operational testing and evaluation of the M551 was both thorough and complete. In fact, the test program could be more properly faulted for overtesting than for undertesting.

The TECOM testing was designed to determine the degree to which the system satisfied a rigid set of military characteristics which were adopted very early in the program and which were not revised to keep abreast of rapidly changing operational concepts within the Army - the emergence of airmobile operations as a logical successor to airborne operations. Furthermore, these characteristics were not challenged by the ultimate users as a result of their operational tests and evaluations.

Many of the design characteristics which were the subject of recommendations for modifications were dictated by the requirement for the vehicle to be air droppable. Relaxation of this requirement very early in the development would have permitted the developer greater latitude in designing against truly critical requirements.

It appears in retrospect that too many high risk components were included in this one system. Testing illustrated this fairly early in the development of the system but irreversible commitments had been made to the production of the system before these test results had been given sufficient visibility at the proper levels.

TEST HISTORY OF THE PERSHING WEAPONS SYSTEM AS IT RELATES TO MAJOR DECISIONS

Background

The PERSHING Program has experienced very little criticism from Congress or the General Accounting Office when compared to the M551 (SHERIDAN/SHILLELAGH) weapons system. However, in many respects, the two development programs were very similar. Both weapons systems were Type Classified Limited Production (TC-LP) before the Operational Test and Evaluation (i.e., Service Test) was completed. In fact, if anything, the PERSHING missile test program was more compressed with TC-LP in July 1961 over two years prior to the beginning of integrated Engineering Test and Service Test (ET/ST) (Sept 63 - Jan 64). This case study will review those features of the PERSHING Program which helped it to become a relatively successful R&D effort, even though production decisions were made two years before the required Army testing (ET/ST) was even started. (See Inclosure 2.)

Discussion

The PERSHING weapons system was developed as a smaller, more mobile replacement for the REDSTONE missile, which had been developed in the early fifties and placed in the field in 1955. The initial Qualitative Military Requirement (QMR) was approved by Department of Army in July 1957. At first the range was not specified; however, the missile weight was limited to a maximum of 10,000 lbs. The PERSHING system was designed to be transported on an XM474E1 tracked vehicle and to be helicopter transportable. Feasibility studies were conducted for the PERSHING missile, and finally on 7 January 1958, the Secretary of Defense authorized the Army to begin its development program. (See Inclosure 2.)

The Martin Marietta Corporation at Orlando, Florida, was awarded the contract for research and development of the PERSHING on 28 March 1958. A second generation missile system, PERSHING Ia, was also developed by Martin beginning in mid-1964 to fill the Quick Reaction Alert (QRA) mission in Europe. The major changes were to increase the number of launchers from eight per battalion to thirty-six per battalion. All tracked vehicles were replaced by new, high-mobility, wheeled vehicles. The number of programmed test stations was increased from four to twelve per battalion. Essentially, the PERSHING Ia is a product improvement of the PERSHING I missile and therefore was a relatively low risk development effort.

The development approach for each end item consisted of preparation of detailed component specification, component design and test, breadboard fabrication and test, engineering model fabrication and test, followed by prototype fabrication and test. The end items then were married into a system, and a weapon system test program, including a flight test program, was conducted. Finally, a rather limited Engineering Test and Service Test concluded the development program.

The PERSHING weapon system development program has generally been successful, meeting milestones without any significant increases in cost over the planned expenditures. This success has been obtained without the benefit of either the Engineering Test or Service Test before a decision was made for production. In fact, the PERSHING I was issued to missile battalions at the same time that the integrated ET/ST was just

beginning. Yet, the PERSHING I system met most of the characteristics specified in the QMR such as target engagement, transportability, environmental effects, configuration, safety, range, accuracy and rate of fire. The PERSHING I system did not fully meet the requirements for reaction time and reliability; however, the PERSHING Ia showed improvement in both these areas.

Analysis

There are a number of factors which enabled the PERSHING missile program to achieve success in the same type of environment that caused the M551 (SHERIDAN/SHILLELAGH) to do so poorly.

1. There was a rather extensive Engineering Design Test Program conducted by both the contractor and the Army Missile Command. Deficiencies were identified early, and corrective action taken to prevent reoccurrence.

2. A highly competent team was formed at the Project Manager level with continuity provided by key civilian personnel.

3. Project Managers have been highly competent, and their replacement has been controlled to occur at logical break points in the development program.

4. There was a solid technical base a Redstone Arsenal which could draw on experience obtained from th JUPITER and REDSTONE missile program.

5. Adequate funding has been provided for the development program without any major budget cuts which might have affected development.

6. There has been strong OSD support for the PERSHING Ia Program.

7. Command interest at all levels, including overseas commanders, has existed throughout the PERSHING Program.

8. A PERSHING office was established at Department of the Army level which aided the overall management of the program.

9. A competent technical and management team was assembled by the Martin Company to work on the PERSHING contract.

10. A high level of motivation was found in personnel at all levels from the contractor to the tactical units. There was a determination to make the system work.

11. Most important, there was a continuous interface between the users, the developers and the contractors. Informal channels of communication were kept open between all echelons.

In summary, the OT&E that was accomplished during the development cycle was more in terms of operational evaluations with Engineering Design Test providing most of the test data. The best OT&E was performed in the missile battalions that were activated using the production missiles. The PERSHING Program demonstrates clearly that the production decision can be made before the OT&E is accomplished, providing other factors are present. In this case, the strong, centralized management teams formed by both the contractor and the Army, plus the close coordination between the user, developer and contractor personnel helped to keep the program out of serious trouble.

TEST HISTORY OF THE OH-6A (CAYUSE) HELICOPTER AS IT RELATES TO MAJOR DECISIONS

Background

The OH-6A helicopter has been selected to illustrate the development of a system under a more conservative philosophy than that used for the other Army systems examined, Sheridan and Pershing.

Discussion

The requirement for a Light Observation Helicopter (LOH) which was to replace the H-13, H-23 and L-19 during the period 1960-1970 was approved in May 1960. This requirement called for a lightweight, reliable, easily maintainable, readily air transportable helicopter capable of performing the following missions: visual observation and target acquisition reconnaissance, and command control. The helicopter was to be of minimum size consistent with the requirement

for a pilot and three passengers, or a pilot and four hundred pounds of cargo. Reliability and front-line supportability were to be given primary consideration.

Aircraft manufacturers were invited to submit design proposals for the LOH in October 1960. In response to this invitation, twelve companies submitted a total of seventeen design proposals for the LOH in January 1961.

A design selection board was convened in April 1961 to evaluate the proposals and select two or more designs to be developed through the flying prototype stage. Three designs were ultimately selected for development. Two of these designs were somewhat conservative product improvements of existing designs while the third, later selected for production, was an innovative departure from past light helicopter design. All three were to use the same engine which was being developed separately to provide an extremely light-weight turbine engine for light helicopter application.

In October 1961 the planned engine for the LOH encountered developmental difficulties of such seriousness that development was initiated on a second, back-up engine. This back-up program was later terminated when the difficulties with the primary engine were overcome.

The three prototypes (five aircraft of each model) were subjected to an intensified military potential test during the period March to June 1964.

A design selection board was appointed in September 1964 to select the most suitable design for the LOH mission. This board, after exhaustive analysis of the results of the military potential test, recommended a price competition for at least 1,000 aircraft be conducted between the two designs selected as most nearly meeting the Army requirement. In October 1964, the Secretary of the Army approved the board recommendation but reduced the quantity to 714.

The OH-6A was type classified for limited production in September 1964 and a multi-year production contract was awarded in May 1965. Engineering and Service Tests were completed in late 1965 and the system was type classified standard A in July 1966.

Various other tests and evaluations were conducted through mid-1968 (see Inclosure 2 for a graphic presentation of test history), and units were equipped as early as December 1966.

Analysis

This helicopter followed an almost idealized development, test and evaluation pattern. The development of three competitive prototypes was feasible due to the relatively low cost involved. The direct competition between the three models in the Military Potential Test gave the decision makers an objective assessment of the options available to them.

The testing of prototypes enabled the Army to discover major design deficiencies before a commitment to full production was incurred. The production specifications could therefore incorporate the results of tests and preclude the production of items with known deficiencies.

The development and testing of several prototypes did not result in increases in either cost or lead time. The initial production price was very reasonable and the first units were equipped with a fully tested and fully operational system only six years after the establishment of the requirement for the system.

The timely provision of test results to the decision makers permitted their proper consideration before decisions were made. The inclusion of test results in the bases for decisions, particularly in the early phases of development, resulted in the production of a system which was not plagued by costly retrofit problems after the system was fielded.

TROOP TEST OF LAND NAVIGATION SYSTEMS

This case history is being presented because this test represents a departure from past test philosophy and will probably be a precursor of tests to come.

Background

The U.S. Army has recognized a requirement for navigation aids in combat vehicles since World War II. Several development programs have been undertaken in the ensuing years, but none produced a satisfactory system until a Canadian company, Aviation Electric, Ltd., combined the results of previous efforts with newly developed components to produce a workable system in the early 1960s. This system was tested by the U.S., British, and Canadian Armies and various improvements were suggested as a result of these tests. The system which emerged was considered operationally suitable by the Canadian and British Armies and has been deployed by both.

Discussion

In 1967, it was decided by the Department of the Army that a Troop Test of Land Navigation Systems was required. This test was to use the Canadian-developed systems in their then current configuration. The test was to determine:

1. The relative tactical advantage, during day and night operations, gained by type test organizations using various mixes of land navigation systems;

2. The relative navigational advantage during day and night of type test platoons/battery command and control elements equipped with various mixes of land navigation systems;

3. The workability of proposed type test organizations equipped with land navigation systems and proposed test training program for use of land navigational aids;

4. The operability, reliability, and maintainability of the land navigation systems; and

5. The logistic and maintenance requirements to support units equipped with land navigation devices.

To support this test, a limited procurement of navigation systems (171) was made. These systems are being installed in various mixes in typical combat units. These units include a tank battalion, a mechanized

infantry battalion, an armored cavalry squadron ( ), a self-propelled artillery battalion, and a brigade headquarters. In each battalion, one company/battery will serve as a base unit and will have no navigation systems assigned; one company will have a very austere allocation of systems and the third will have a rather generous allocation of systems.

Each of these units will be exercised in accordance with a set scenario, and the results will be compared to determine the advantage gained, if any, by the addition of land navigation systems.

This test will be conducted during April 1970 at Fort Carson, Colorado.

Analysis

This test will embody several features which have been recommended by various high level bodies such as Congress and the President's Science Advisory Committee. It will provide for operational test and evaluation of the navigation systems before full scale procurement is initiated. The system is a fully developed foreign product which, if procured, will be produced in the U.S. The test will establish a current capability against which the tested capability can be compared.

TES: HISTORY OF THE A-6 A (GRUMMAN ALL WEATHER ATTACK AIRCRAFT) AS IT RELATES TO MAJOR DECISIONS

Background

The Operational requirement for the A-6 was promulgated in October 1956. A contract was let for 4 R&D aircraft in 1958 and 4 in 1959. The first flight of the A-6 was conducted in April 1960 and the first production contract for 12 A/C was let in July of 1960 for delivery at the rate of 1 per month, starting in January 1962. (See Inclosure 4).

Discussion

Phase I of the Navy Preliminary Evaluation (NPE) was completed on 30 November 1960. The NPE is the Navy's first chance to evaluate, with Navy pilots flying the aircraft, the characteristics and suitability of a weapon system for Navy use. The purpose was to evaluate at an

early date, handling qualities and performance tests in order to estimate the degree to which operational requirements would be met and to allow early correction of deficiencies. The results were as follows:

1. 5 highly desirable characteristics which were worthy of special mention.

2. 13 items for which correction was mandatory for satisfactory service use. (No major items)

3. 28 items which it would be desirable to correct.

4. 1 item that should be considered in any future design.

Phase II of the NPE was completed on 8 December 1961 in which flying qualities with latest changes, air refueling, mission suitability with avionics systems, and all weather capabilities were tested. In this series of tests there were numerous discrepancies that needed correcting prior to service use, the majority of which were in the avionics system. The terrain avoidance and the main radar presentation were unacceptable and alternate systems were recommended.

Phase III - 1 of the NPE tests was completed on 5 September 1962. The purpose was to evaluate flying qualities, the automatic flight control system, the production cockpit display, night air refueling capability as a tanker and corrections to deficiencies previously reported by previous test results. The results showed that 34 of the previous discrepancies had been corrected satisfactorily. There were 10 uncorrected or new deficiencies which were considered mandatory prior to service use. There were 40 deficiencies which were considered desirable to correct. The NPE Board recommended that the 10 mandatory deficiencies be corrected prior to delivery of the A-6 to the Navy for further testing and that the desirable corrections be corrected on a high priority basis. The Board of Inspections and Survey trials started in October 1962 and were to continue until June 1965 before the A/C was formerly accepted for service use. The Carrier Suitability demonstrations were completed on 19 November 1962. The A-6 did well on the carrier suitability demonstrations and had only 5 deficiencies which were considered mandatory to correct. These were all fairly minor and correctable.

Although the BIS trials were not complete at this time, the results of Phase III NPE and the carrier suitability demonstrations showed no major airframe problem areas and a follow-on production contract for 23 aircraft was let in November 1962 and for an additional 37 in June 1963. Service acceptance trials on the A-6 continued through January 1965. During these tests various discrepancies were found and corrected. The avionics system was a big step forward in the state-of-the-art but was plagued with various problems, the greatest of which was reliability. The mean time between failure (MBTF) of various components did not meet guaranteed requirements in many instances. By redesign of bits and pieces, changes and modifications which were incorporated on production line A/C as soon as they proved to be satisfactory, performance improved greatly and in March of 1965 the President of the Board of Inspection and Survey recommended that the A-6 A be accepted for service use when specified mandatory deficiencies were corrected. On 14 March 1966, the Chief, Bureau of Naval Weapons reported to the Secretary of the Navy that the deficiencies had been corrected, except for a few minor exceptions where further development was still going on, and recommended that considering the high degree that the A-6 A met the contractual requirements that it be accepted for service use.

Analysis

Because of the press of SEA the A-6 was introduced into a fleet squadron in November 1963 and deployed to SEA in late Spring 1965.

The Operational Test & Evaluation Force VX-5 received its first A/C for operational test and evaluation in March of 1965. This was because spares and support equipment were not available for support of another site. However, OT&E and Replacement Air Group Training were conducted together at the Naval Air Station, Oceana starting in October 1962 concurrently with the Service Acceptance Trials at Patuxent River. This is not desirable because the fleet had to train and develop tactics with aircraft that were not fully tested and had various deficiencies to overcome. It did, however, get squadrons trained to deploy with a capability and aircraft that were sorely needed in SEA in the Spring of 1965. The aircraft which the squadron deployed with were right off the production line with all of the changes and modifications incorporated that the Board of Inspection and Survey

recommended in its March 1965 report. If the production line had been closed, after delivery of 20 A/C in 1962, until testing recommended service acceptance in 1965, and a decision to produce was then made, it would have been approximately 1968-70 before the A-6 could have been deployed in combat. The A-6 has proved to be an outstanding weapon system which performed exceptionally well in combat in SEA. This capability might not have been achieved in SEA if the "Try before Buy" concept had been used.

TESTING HISTORY OF THE C-141 AIRCRAFT (CATEGORIES I, II, AND III)

Background

The C-141 aircraft has entered the U.S. Air Force inventory as a principal item in the attainment of a new capability in its world-wide logistic support mission (System 476L). It has been produced in quantity (284) after having undergone the complete acquisition and operational test cycle prescribed in Air Force Regulation 80-14. The airplane itself features four turbofan engines separately mounted, a high wing with 25° sweep, fuselage mounted landing gear, truck bed height level cargo compartment and high T-tail empennage. Its principal performance characteristics are as follows (approximately):

Takeoff weight, maximum	316,600 lbs
Payload	59,300 lbs at 4000 NM
Speed, maximum	506 Kts.
Average cruise speed	431 Kts.
Takeoff distance over 50' obstacle (sea level)	5,660 ft @ max gross T.O. wt
Landing distance over 50' obstacle (sea level)	3,870 ft @ 257,500 lbs

The C-141 program from conception to production finish, covered the time period from May 1960, when the Specific Operational Requirement was published, to the first quarter of CY 1968. At this writing all testing of the system has been completed except some phases of the fatigue test which are expected to be finished in 1973, due to a USAF decision to test to a factor of 4 in lieu of 2 life times.

The C-141 System management concepts were directed toward organizing and employing various functional agencies, each of which made its own particular contribution to the overall development and acquisition plan. These were.

Air Force Systems Command (AFSC) - Development, test, procurement, production

Air Force Logistics Command (AFLC) - Supply, maintenance, transportation

Air Training Command (ATC) - Training

Military Airlift Command (MAC) - Operations

U.S. Army - Adviser

Lockheed - Georgia - Manufacturer

Federal Aviation Agency - Certification (of aircraft for potential commercial applications)

U.S. Corps of Engineers - Facility construction

By the application of centralized management principles the inputs of these functional agencies were coordinated and used in the conceptual, development, test and production phases of the program. This philosophy produced an integrated effort which recognized all facets of the system acquisition problem and gave proper weight to each of them. The extent to which this was carried in the evaluation cycle is reflected in the fact that the Category III testing was done by a Joint Test Force, in which the Military Airlift Command was joined by AFSC, AFLC, ATC, the U.S. Army, and the contractor, with a record of outstanding success. The final result was an airlift system which was responsive to the needs of all users, operators, and support agencies.

TEST DIRECTIVES

Category I - Air Force Regulation 80-14
Category II - Aeronautical Systems Division of AFSC
Category III - Military Airlift Command - Test Plan dated January 1965 authorized by AFR 80-14

TEST ORGANIZATION

Category I - Lockheed - Georgia
Category II - Air Force Systems Command (with Lockheed assistance)
Category III - Military Airlift Command (Joint Test Force with AFSC and Lockheed assistance)

TESTING PERIOD (See Inclosure 5)

Static Test - June 1963 - June 1965
Fatigue Test - August 1963 - factor of 2 completed December 1967
factor of 4 will continue through 1973
Category I and II - September 1963 - May 1965
Category III - April 1965 - July 1966

TEST ITEMS

Category I - 5 aircraft
Category II - 3 aircraft (first production)
Category III - Entire operational fleet then in inventory (approx 122)

TEST SITES

Category I - Lockheed facility in Georgia and Edwards AFB, Calif.
Category II - Flight test at Air Force Flight Test Center, Edwards AFB, California and Ft. Bragg, N.C. Environmental tests at El Centro, California, Eglin AFB and Alaska
Category III - Travis AFB, California and MAC's world-wide routes

Test Results

Although the Air Force was an active participant in the Category I tests of the C-141 with an eye toward early evaluation of the airplane, it was Category II testing which was more productive from a military standpoint. The prime Category I objective was to obtain the FAA type certification. In general, the Category II tests showed the C-141A capable of fulfilling the Specific Operational Requirement (for a large capacity, high speed transport with long range and an air drop logistic capability). 2500 flight hours in one year of testing showed no significant airframe structural deficiencies. There were shown to be some undesirable aerodynamic characteristics, none of them major. 347 recommendations for minor or desirable improvements were made as a result of Category II. Category III tests, which employed a considerable number of the MAC fleet then in inventory, were based on a much larger sample size. The principal results of these tests reinforced the findings of Category II, which was significant in the light of the fact that data were obtained in tactically realistic conditions. Information was derived from logistics missions flown in support of the Southeast Asia effort in addition to several large-scale exercises in other world areas. In general, the C-141 was found to be tactically suitable for its intended role, to be supportable from a logistics and maintenance standpoint, and to possess the operating characteristics that are desirable in a long range, fast, versatile transport of its type. Several minor problem areas were uncovered most of which were correctable by small design changes or local modification programs. In the main, however, the Category III portion of the test program bore out the wisdom of the earlier decision to produce the aircraft.

Decisions Made as Result of Testing

As a result of a System Discrepancy Report (SDR) System used during Category II and III testing of the C-141, a total of 760 problems was identified, of which 140 resulted in Engineering Change Actions (auxiliary power unit exhaust, redesign of cargo ramp, etc.) 146 were taken care of by local action (in the operating activity) and the balance distributed between "Quality Control" and "No Action Warranted." As observed before, the testing had no influence on the acquisition decision.

Costs

(Limited to contract costs - do not include government-furnished material or manpower.)

Category I - $46.530M (4,008,000 manhours)
Category II - 3.060M (80,000 manhours) estimated
Category III - 2.349M (2,610 flying hours) estimated

TESTING HISTORY OF F-5 AIRCRAFT

Background

The F-5A/B was designed as a clear air mass fighter, intended to perform the classic functions of the fighter mission, i.e., air superiority, interdiction, close air support, and aerial reconnaissance. It is a relatively light, very maneuverable supersonic aircraft. Simplicity of operation and maintainability were stressed when the airplane was designed. The F-5A is a twin-engined single place aircraft equipped with two M-39 (20mm) cannons. The F-5B has a second cockpit in place of the guns. The RF-5A is the photo reconnaissance version of the F-5 series (See Inclosure 6).

The F-5 aircraft was specified to fill the requirements of the U.S. Military Assistance Program (MAP) for a simple, effective, easily supportable fighter weapon system. Its design was an outgrowth of that of the T-38 trainer used for several years by the USAF Air Training Command. Low unit cost, low operating cost, light weight, ease of maintenance, two-engine safety and relatively high performance are features of the concept. Principal differences between the trainer and the F-5 are the modifications to the wing structure to give it an external load-carrying capability, its armament equipment, and its low footprint pressure (to enable it to operate from sod or austere fields).

The testing cycle of the F-5 was unique to the extent that, in addition to the regular USAF Category I, II, and III tests, the system was evaluated in a combat environment when a 12-aircraft squadron was deployed to Southeast Asia in late 1965. As project SKOSHI TIGER, the F-5 squadron was compared with F-100 and F-4 equipped organizations

in the theater in an attempt to get data bearing on force mix decisions, etc., i.e., sortie rates, logistic comparability, maintenance requirements and the like. The F-5 tactical fighter can be said, therefore, to have been thoroughly evaluated - from its performance as a training airplane to its demonstration in combat.

Test Directives

System Program Directive - Feb 64
Category I test plan prepared by Norvair Division, Northrop Corp.
Category II/III test plan prepared by AF Flight Test Center and approved by System Project Office - Systems Division, Aeronautical, AF Systems Command

SKOSHI TIGER test plan prepared by AFSC/TAC

Test Sites

Category I - Contractor facilities and Edwards AFB
Category II/III - Edwards AFB, California
Environmental Tests - Eglin AFB, Yuma, Arizona and Eilson AFB, Alaska

Test Organization

Primary

Category I - Contractor - Norvair Division of the Northrop Corporation
Category II/III - Air Force Systems Command, Air Force Flight Test Center, Edwards, AFB, Calif.
Category II/III - Tactical Air Command
SKOSHI TIGER - 10th Fighter Command Squadron

Support

Aeronautical Systems Division, AFSC, Wright-Patterson AFB, Ohio
- Managing Agency for F-5 Program and CAT II Adverse Weather Test Program

Air Proving Ground Center (Now Armament Development and Test Center). Eglin AFB, Florida - Climatic Laboratory support of CAT I Program
Air Training Command, Randolph AFB, Texas
Personnel training for all phases
Air Force Logistics Command, Wright-Patterson AFB, Ohio
Logistic support for all phases

Test Items

At the peak test period in the CAT I/II/III cycle there were 13 aircraft in the test inventory (one N-156 - the forerunner of the F-5, two YF-5A preproduction models, two F-5B, and eight F-5A).

SKOSHI TIGER was conducted with a 12-aircraft squadron of F-5 aircraft, one of which was lost to enemy action.

Test Results and Resulting Decisions

In general, the tests indicated to the testing organizations and the Systems Project Office that the F-5 A/B weapon system fulfilled the Specific Operational Requirement. The recommendations made in the test reports were mainly to correct minor design deficiencies or to highlight improvements thought desirable but which were outside the original requirement. Of the 227 recommendations made, 131 were accepted and implemented without change, 68 were implemented after revision and the balance were rejected. There were 62 Engineering Change Proposals generated by the recommendations of which 84% were approved.

SKOSHI TIGER testing of the aircraft (not including the sortie rate potential, maintenance evaluation, and logistic supportability investigation) was limited to safety-of-flight items and flight clearance of certain armament not previously cleared. SKOSHI TIGER combat experience led to the incorporation of the following on all F-5A airplanes:

a. Gunbay screens (to eliminate ingestion of spent cartridge cases)

b. Increased rudder authority (to improve ground handling characteristics)

c. Windscreen rain removal system

d. Improved design of the gun/bombing sight

Test Costs

Following are estimated contract costs and do not include government-furnished material or manpower (bombs, ammunitions, rockets, fuel, and oil, and military and civilian personnel at the test sites). The latter are not readily available.

Category I - $7.9M
Category II/III - $1.4M
SKOSHI TIGER - $200K

DEVELOPMENT HISTORY OF THE M-16 RIFLE [1/]

Background

The M-16 was designed in 1957 by Mr. Eugene M. Stoner, Armalite Division, Fairchild Engine and Airplane Corporation, to meet an expressed Army requirement for a lightweight, high-velocity rifle of smaller caliber than the standard 7.62mm NATO caliber. Colt bought production rights for the new rifle in 1959.

Development and test of the rifle did not go through the usual, rigorous design competition and lengthy competitive testing to verify that a detailed set of requirements had been met. The Commanding General of Continental Army Command had informally requested Mr. Stoner to examine the Army's need for a lightweight rifle in 1957. Mr. Stoner developed a weapon design patterned after the NATO 7.62mm AR-10 rifle but in 5.56mm caliber. This rifle was called the AR-15 in the commercial version, later receiving the military designation of XM16E1 until standardized as the M-16 for the Air Force and as the M-16A1 for the Army and Marine Corps. (The M-16A1 has a manual bolt closure device not on the M-16.)

1/ Inclosures 7 and 8 contain a chronology of events.

Mr. Stoner designed the AR-15 to use cartridges containing a commercial propellant called Improved Military Rifle (IMR) powder and using commercial primers. Quantity production of this propellant later became a major problem because of the high rejection rates necessary owing to powder lots exceeding chamber pressure limits. Army policy of dual production sources led to introduction of different types of IMR propellant and to production of ball propellant with different characteristics and performance.

IMR and ball propellant powder had substantially different chamber pressures. Ball propellant also caused greater fouling. Colt encountered excessive malfunctions with ball propellant; in 1965, more than half the production weapons exceeded bolt cyclic rate limits with ball propellant. To meet Vietnam weapon requirements, the Army permitted Colt to use IMR powder for acceptance tests even though both IMR powder and ball propellant powder cartridges were issued to the troops.

To overcome malfunctions encountered with the use of ball propellant, the M-16 was redesigned with a modified buffer to take up part of the bolt recoil and to slow it down. Then the rifle malfunctioned with IMR powder.

Cleaning equipment was found to be inadequate or lacking. There was only a limited issue of ramrods. Improper lubricants were employed in the field in an attempt to cope with the malfunctions. Use of these lubricants caused additional manfunctions and corrosion.

Discussion

Armalite Division produced several AR-15s in 1958 and delivered them to Ft. Benning and Aberdeen Proving Ground for test. In tests at Ft. Benning, the AR-15 malfunctioned considerably fewer times than did the standard M-14 rifle against which it was fired. The results were: AR-15 - 6.1 malfunctions per 100 (3578 rounds fired); M-14 - 16 malfunctions per 100 (2337 rounds fired).

Mr. Stoner made several minor modifications as a result of these tests including two-piece handguard, modified safety, larger outside barrel diameter at the muzzle and buffer assembly modification. These became standard in the AR-15.

Concurrent with the brief Army tests in 1958, Mr. Robert W. Macdonald of Cooper-Macdonald, Inc., who had a sales promotion contract with Fairchild, demonstrated the AR-15 and M-14 in the Philippines, Malaysia, Indonesia, Thailand, Burma, Italy and India. The first AR-15s (25) were sold to Malaysia on December 5, 1959; the next AR-15s (1250) to Indonesia March 11, 1960; and ARPA ordered 1000 AR-15s on December 27, 1961 for test in Vietnam. The Air Force first procured the AR-15 (8500) in May 1962 by contract with the new manufacturer, Colt Industries, and the Army first procured a small quantity (338) in October 1962 for evaluation and test. The next major military procurement was in 1964 when the Army bought 104,000 M-16s (85,000 for the Army and 19,000 for the Air Force). By December 31, 1967, the Army procurement rose to 996,157 total since its first procurement in 1962. Over fifty other countries had also purchased small quantities of the M-16 during the period 1964-1967. On April 19, 1968, "second-source" selection contracts were let to General Motors and Harrington-Richardson for 240,000 rifles each.

Malfunctions were alleged to have caused a number of deaths in combat. This unfavorable publicity resulted in intensive Congressional investigation in 1967 and eventual product modification.

Although there is no formal procedure for the development of small arms, it can be seen that development, test, evaluation, and purchase of the M-16 did not follow the norm. Different DOD agencies had ordered and independently tested small quantities of the weapon. In retrospect, it appears that these tests were overlapping, uncoordinated, and carried on in some cases under insufficiently qualified supervisors. In particular, these tests did not reveal many of the problem areas found in later intensive operational use.

In tracing the history of the M-16 many facets appear obvious today which were not recognized at the time. From most accounts, the AR-15 as tested in the US and in Vietnam during the period 1958-1964 performed very well. It must be recognized that these tests were with a different version of the rifle than that which malfunctioned so frequently in the period after 1964, the M-16.

On the other hand, the tempo of the Vietnam war was different before 1965 when there was a maximum of 17,000 US troops in all of Vietnam. The Vietnamese soldiers were enthusiastic about the 1000

AR-15s they tested over an extended period from 1962-1964. Yet there was little sustained close range fighting during this period. Air Force personnel receiving the AR-15 after 1962 were generally using the weapon for guard duty where malfunctions were not likely either to be encountered or considered quite so serious as in close combat.

After 1964, the situation changed. The serious sustained close combat by many units of the several hundred thousand troops now in Vietnam generated frequent situations where life was dependent upon weapon performance. Malfunctions were reported in increasing numbers.

Later investigations, tests and inspections have shown a number of causes. These include:

o Poor troop discipline in maintaining the rifles and lack of cleaning equipment, including ramrods. Without ramrods, there was no way to remove a shell in the chamber.

o Redesign to accommodate the new propellants. This caused malfunction with the original propellant (IMR) in the cartridges already procured.

o Cartridge magazines had springs with improper tension, causing jams.

o The test and evaluation of different lubricants by different combat units not understanding the chemistry of the lubricants caused additional malfunctions. Improper cleaning and lack of cleaning equipment also resulted in many weapon failures.

o Unfortunately, it was not realized for several years that variations in powder would have a major impact on M-16 functioning. Modifications (made to correct four malfunctions) caused other malfunctions when powder types were used interchangeably. The IMR 4475 propellant gave excessive chamber pressures unless there was good quality control. Ball propellant caused more fouling. It also increased the cyclic rate of the bolt from the norm of 650-850 to over 1000 cycles a minute and this caused rapid wear on parts and ejection malfunctions. Chrome plating the chamber added for hardness and cleaning ease reduced malfunctions with IMR but aggravated them with ball propellant.

The M-16 malfunctions became increasingly serious after 1964 as major weapon procurement was increased to keep pace with the rising troop strength and war tempo in Vietnam.

For some time the military, OSD and contractor efforts to correct deficiencies appear to have been more a piecemeal than a systems approach. For exa e, Col. was allowed to test-qualify production weapons using the IMR type of powder that worked well although the weapons would malfunction with ball propellant also issued to the troops.

There have been product improvement modifications on over 54 of the 223 parts of the original AR-15, commencing with minor modifications by Mr. Stoner after his 1959 tests to the Army. Through mid-1967 there were 159 engineering changes in the Colt contracts, of which 10 were considered by the program manager to significantly improve the weapon.

The rifling twist started at 1 to 14 (one turn of the bullet in 14 inches of travel) but was changed to 1 to 12 to overcome alleged instability in extremely cold weather. Later, the original twist was tested again because of continued uncertainty of performance in each case. The Army also added a manual assist bolt closure device requirement although testing did not substantiate a need for it.

In 1967-1968, after the Ichord Committee had reported to the public on the M-16 rifle problems, the Weapons Systems Evaluation Group supervised an operational test in Panama under simulated combat conditions, using USMC riflemen. WSEG conclusions confirmed the M-16 variation in performance with different modifications and different powers.

The cumulative effect of Congressional attention and DOD investigation finally led to an improved M-16 variation.

Conclusions

Even in the relatively simple M-16 rifle system, a design change to one portion of the system drastically altered the performance of other elements and caused serious combat malfunctions. A change in one part of the system should have been fully tested with the system as a whole before being accepted.

The results of field tests of proposed changes by the user should have been treated as suspect and should have been repeated under controlled conditions by qualified test personnel for verification.

There was a need for closer Government supervision of contractor production practices and inspection.

High-level decisions on weapon changes were made without supporting facts and were unnecessary.

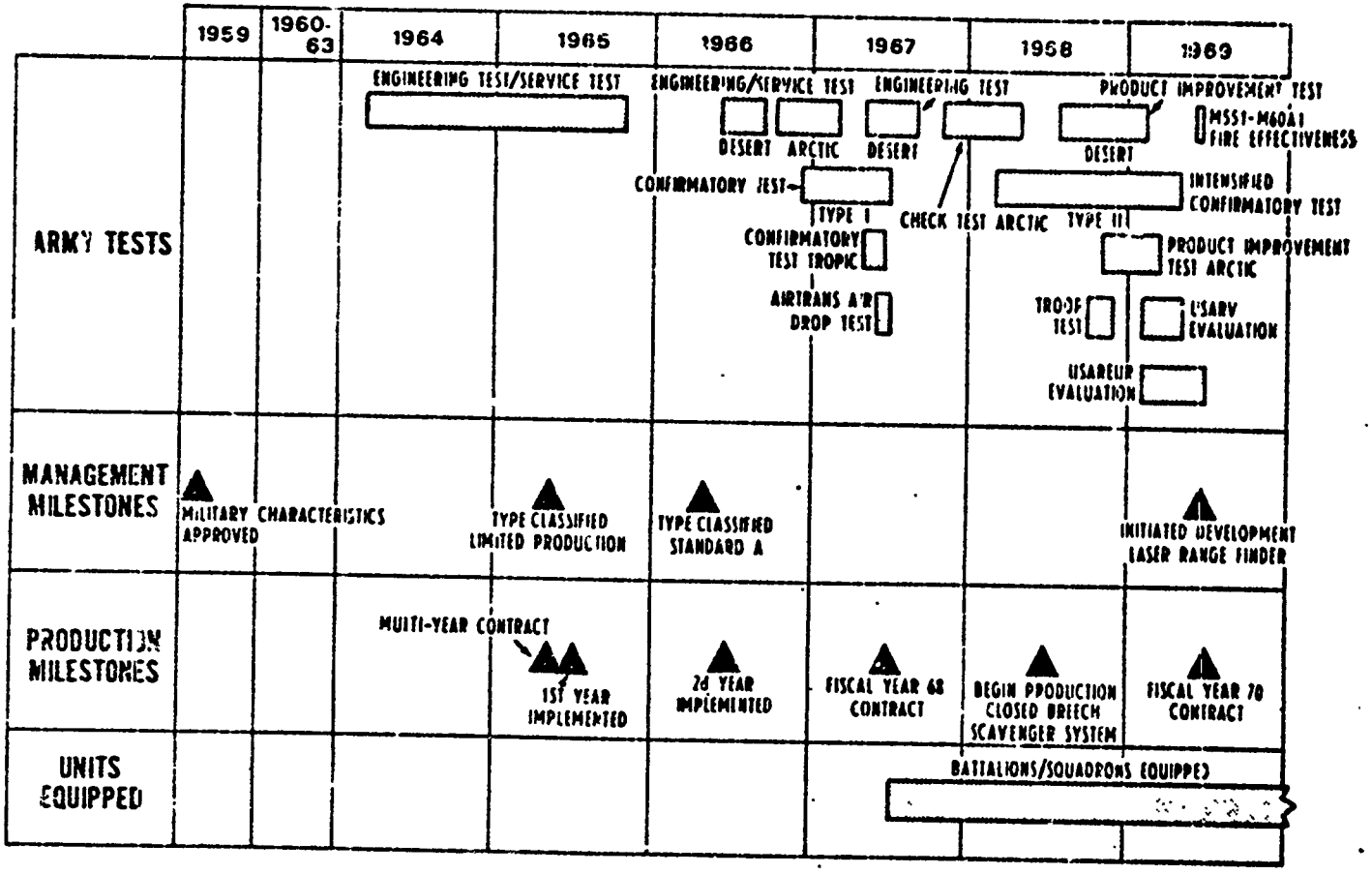
The Government failed to plan from the beginning for a technical data package and manufacturing rights and thus paid a great deal in the end.

Poor command supervision at all levels over weapon maintenance (inadequate cleaning and care of weapons in the field) and over issuance of cleaning instructions and cleaning materials was a major factor in weapon performance.

M551 WEAPONS SYSTEM

(SHERIDAN/SHILLELAGH)

CHRONOLOGY OF TESTING AND DECISIONS



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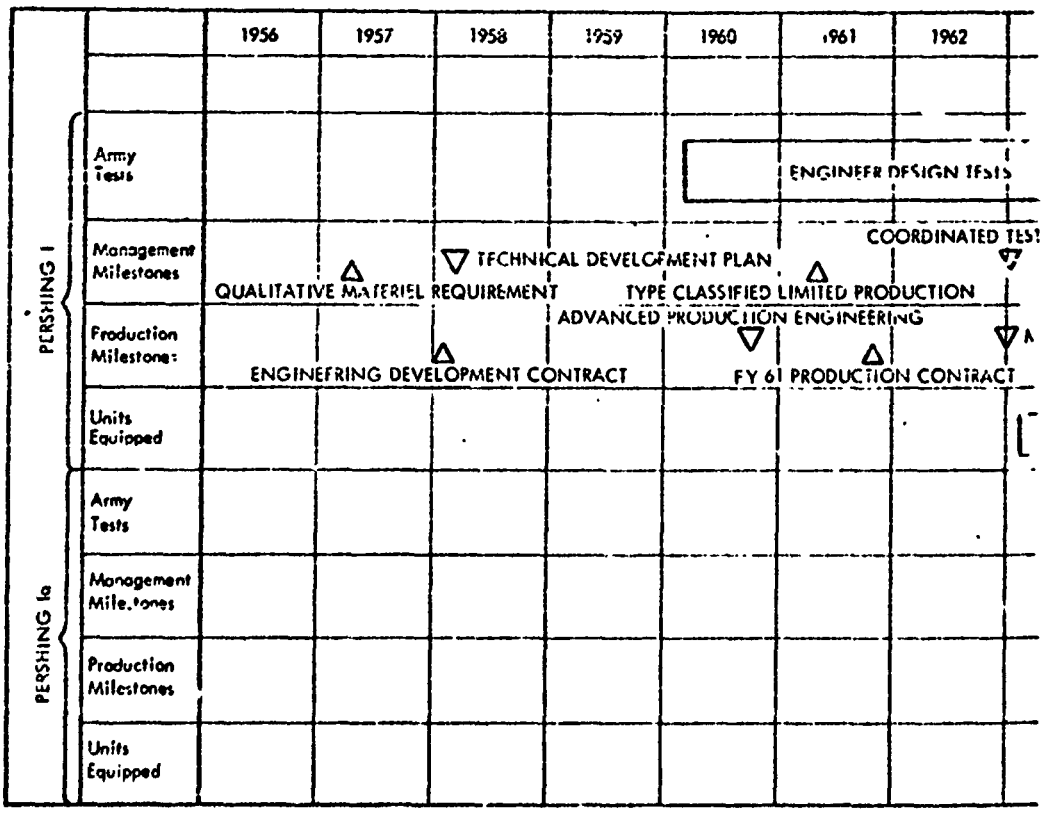

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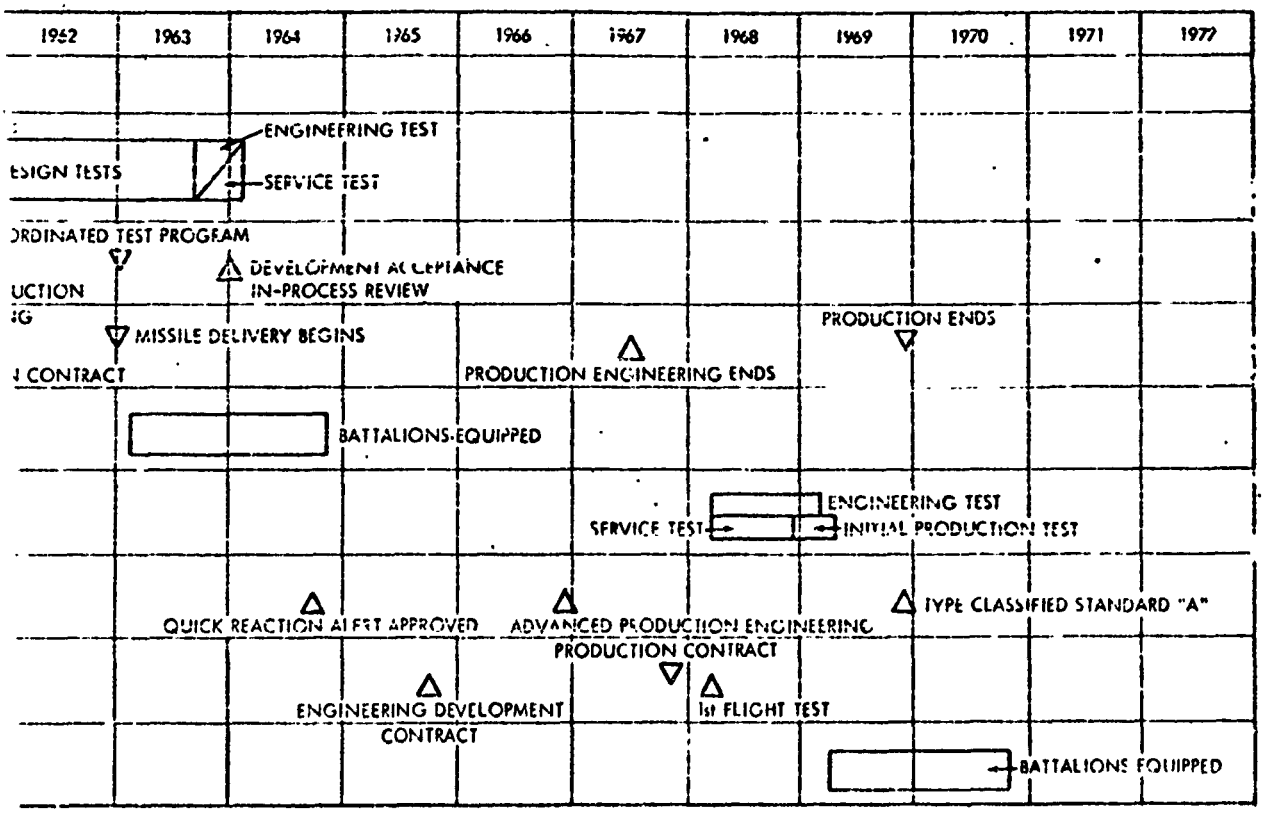
LOGY OF TESTING AND DECISIONS



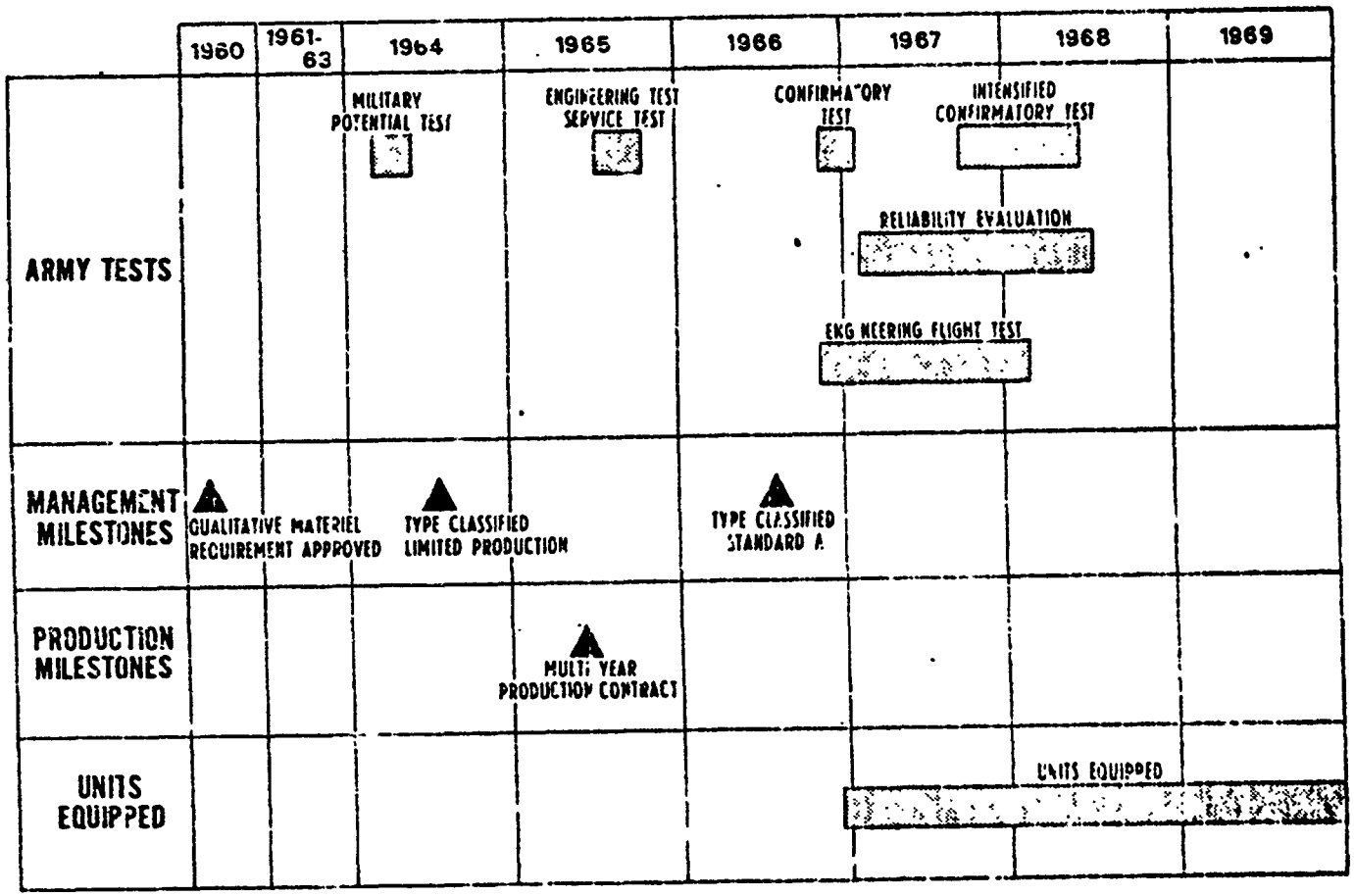
Inclosure 3

F-28L

OH-6A HELICOPTER

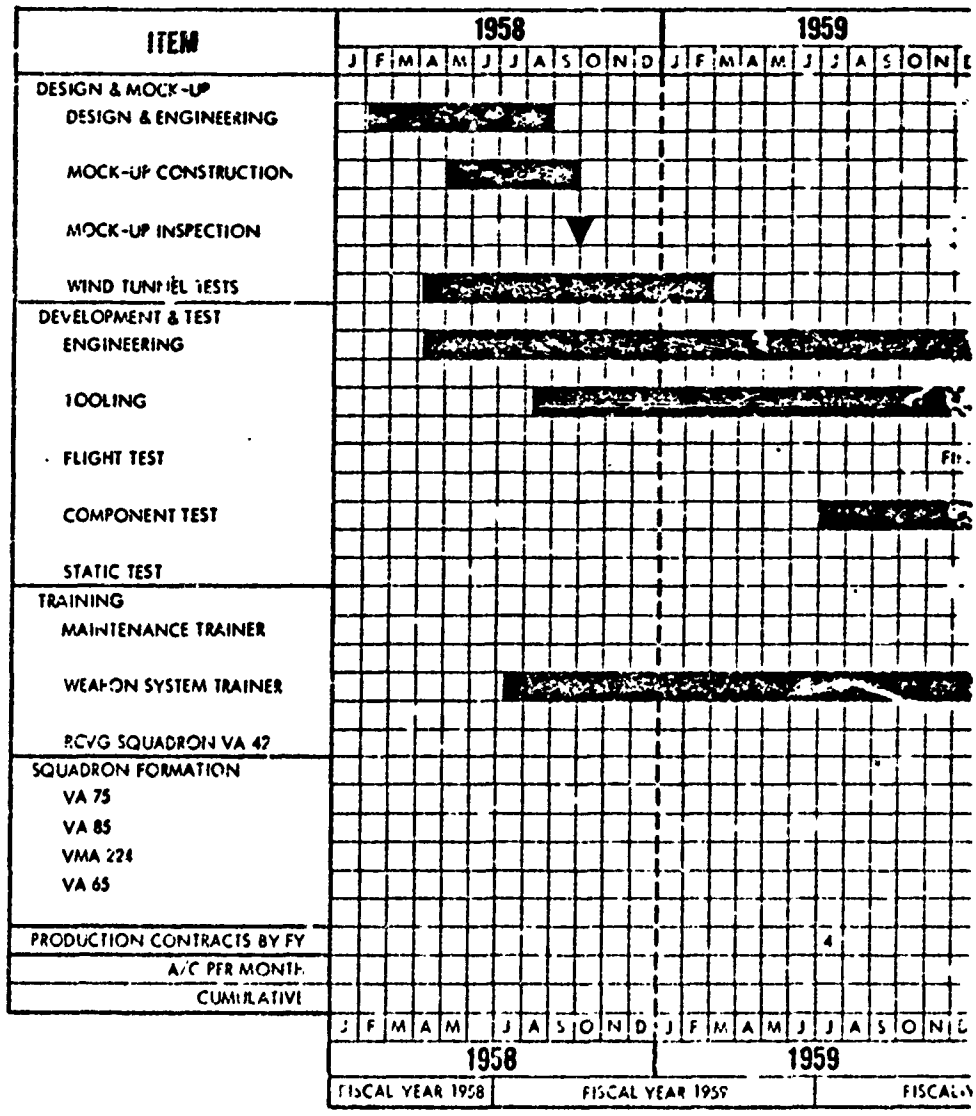
(CAYUSE)

CHRONOLOGY OF TESTING AND DECISIONS



Inclosure 3

MASTER PHASING PLAN



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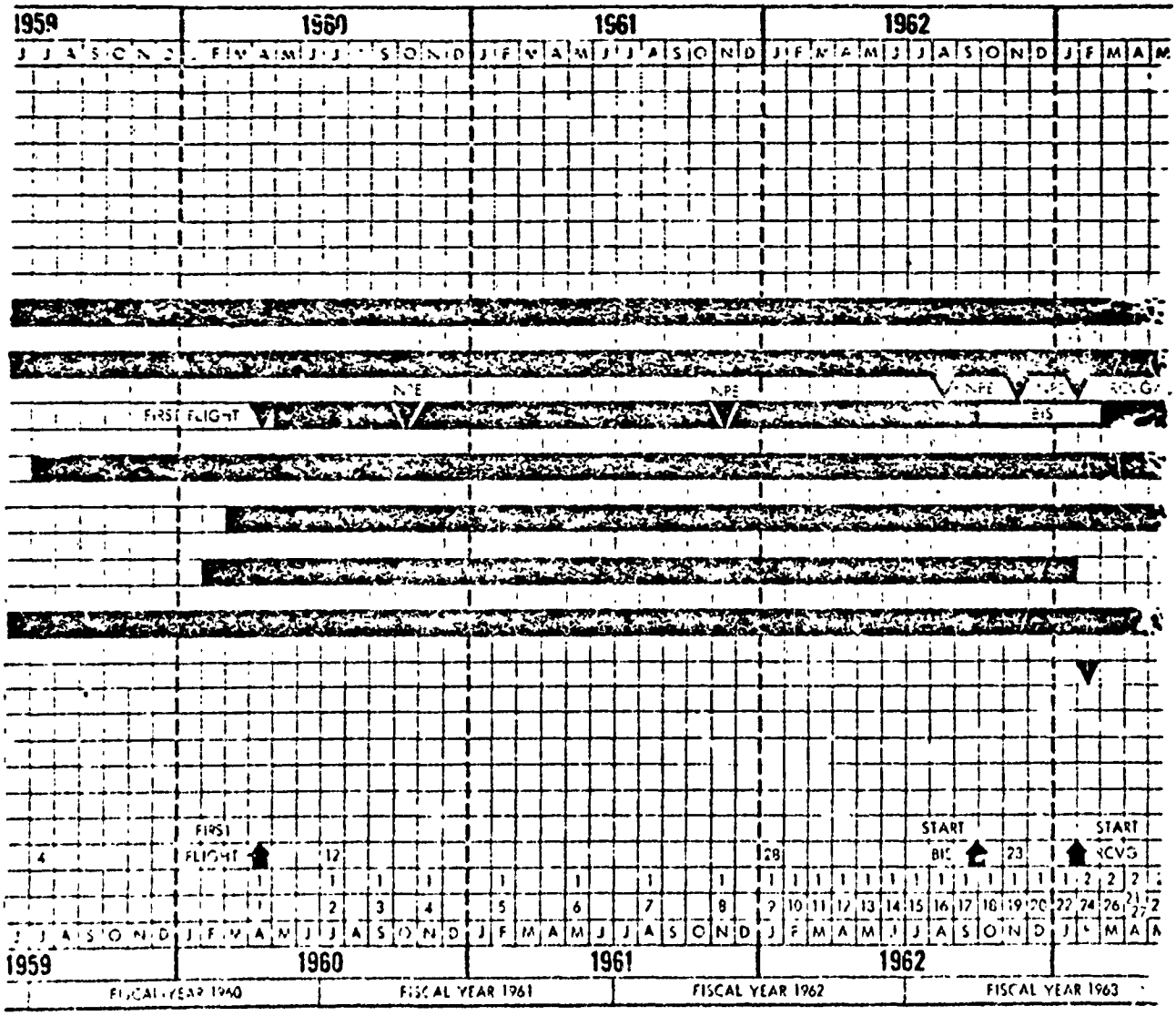
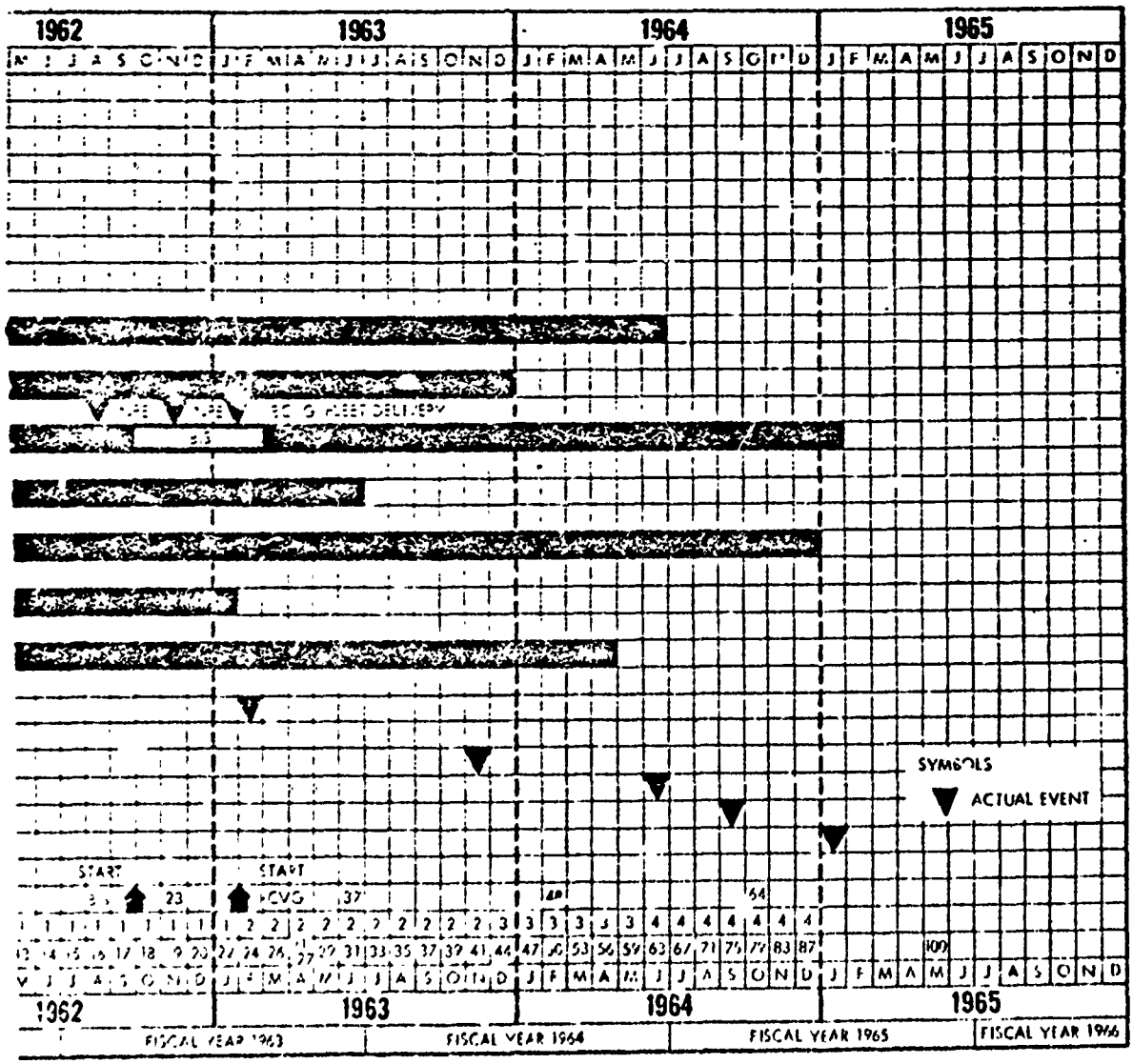
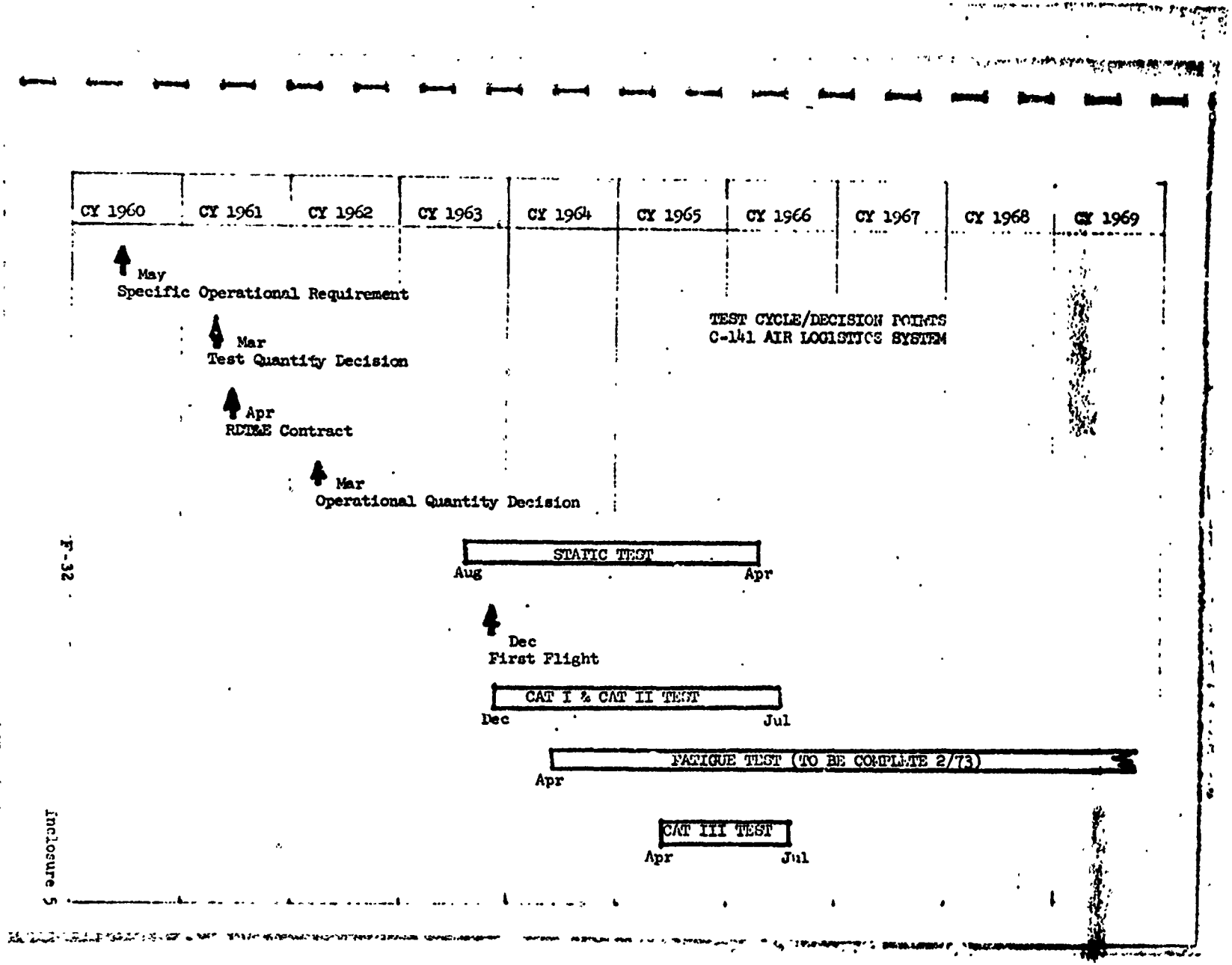
A-6A AIRCRAFT

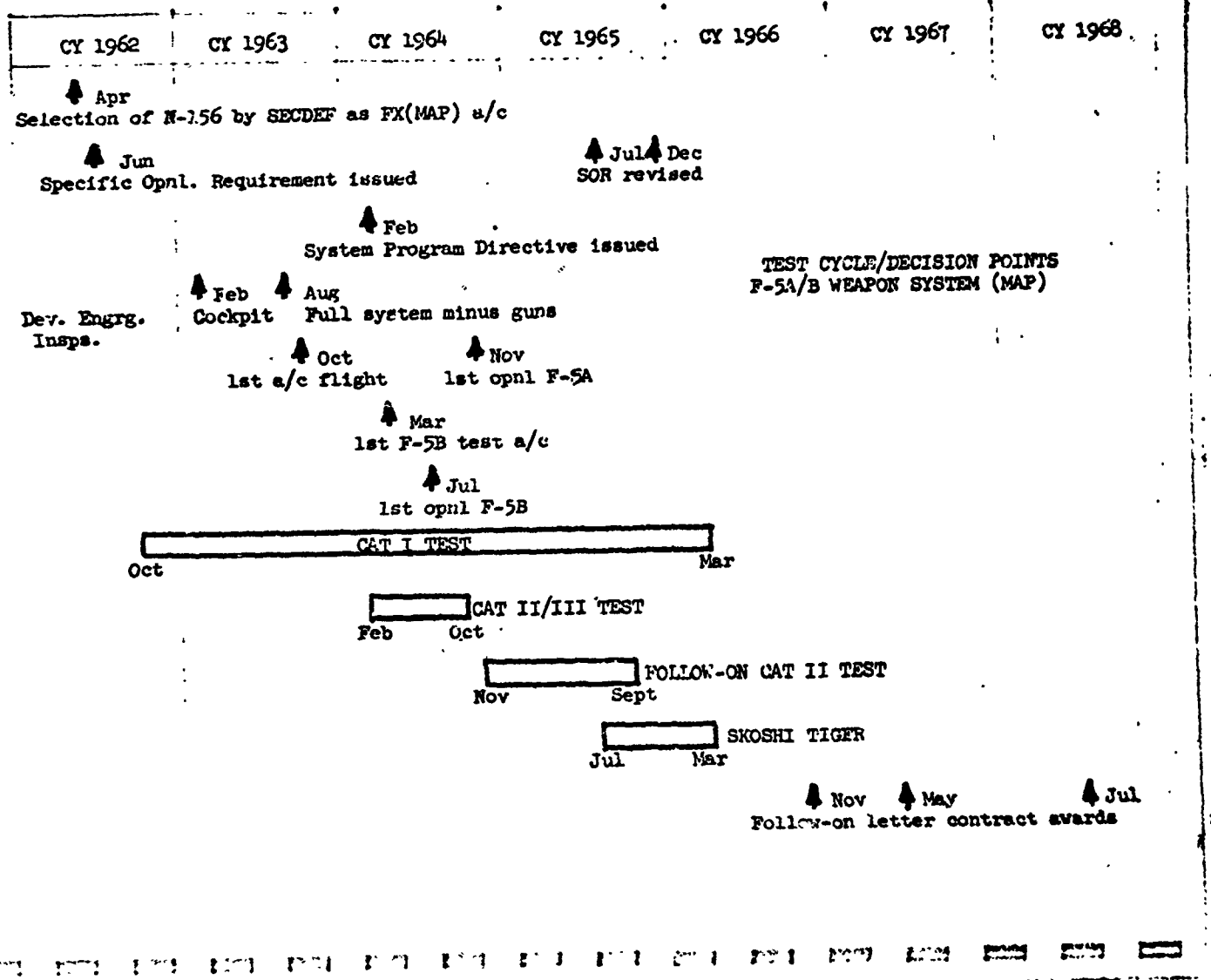



1962
1963
1964
1965
SYMBOLS
ACTUAL EVENT
START
START
FISCAL YEAR 1963
FISCAL YEAR 1964
FISCAL YEAR 1965
FISCAL YEAR 1966

F3a


CY 1960
CY 1961
CY 1962
CY 1963
CY 1964
CY 1965
CY 1966
CY 1967
CY 1968
CY 1969
May
Specific Operational Requirement
Mar
Test Quantity Decision
Apr
RDT&E Contract
Mar
Operational Quantity Decision
TEST CYCLE/DECISION POINTS
C-141 AIR LOGISTICS SYSTEM
STATIC TEST
Aug
Apr
Dec
First Flight
CAT I & CAT II TEST
Dec
Jul
FATIGUE TEST (TO BE COMPLETE 2/73)
Apr
CAT III TEST
Apr
Jul

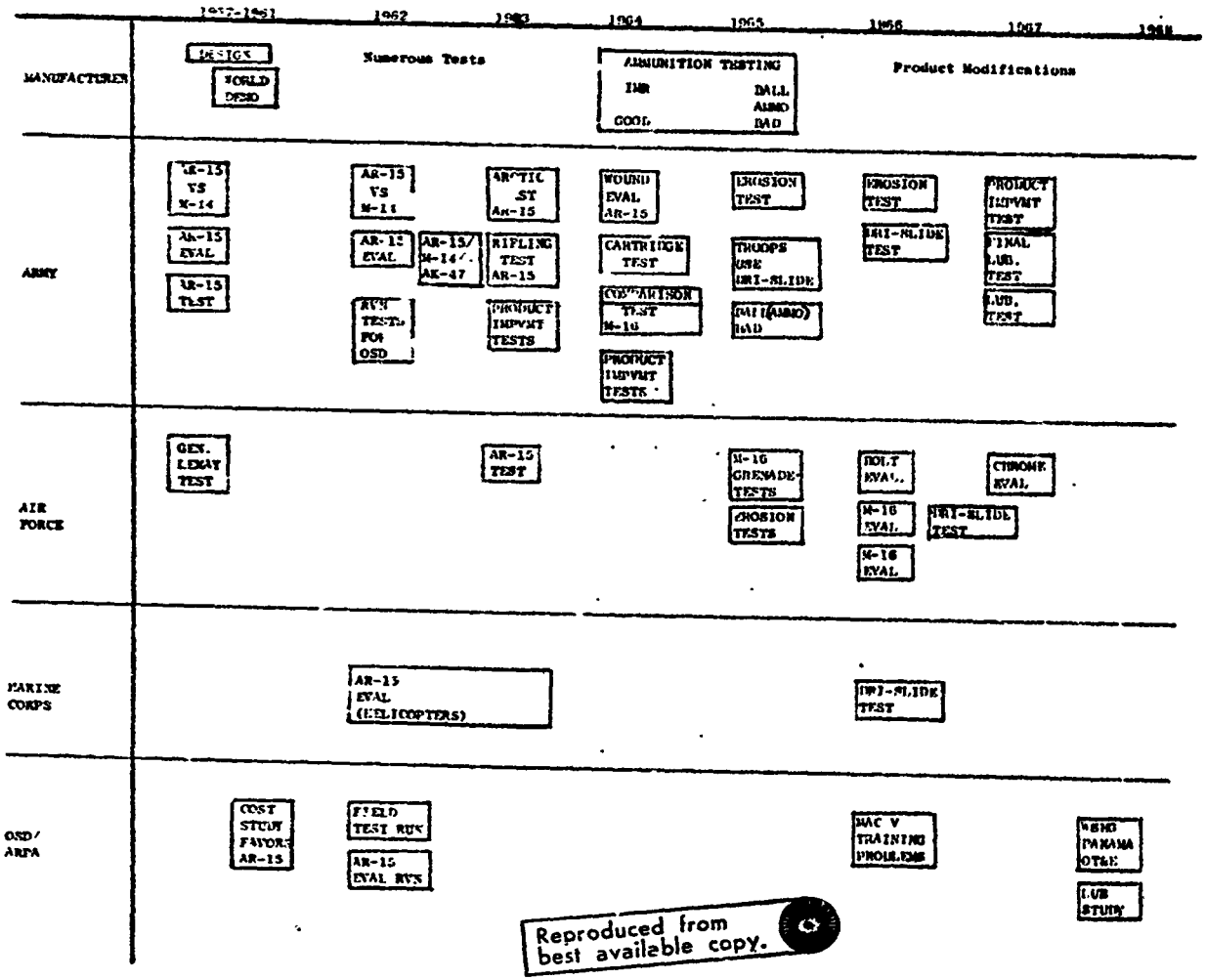
Enclosure 5


CY 1962
CY 1963
CY 1964
CY 1965
CY 1966
CY 1967
CY 1968
Apr
Selection of N-156 by SECDEF as FX(MAP) a/c
Jun
Specific Opnl. Requirement issued
Jul
Dec
SOR revised
Feb
System Program Directive issued
TEST CYCLE/DECISION POINTS
F-5A/B WEAPON SYSTEM (MAP)
Feb
Cockpit
Aug
Full system minus guns
Dev. Engrg.
Insps.
Oct
1st a/c flight
Nov
1st opnl F-5A
Mar
1st F-5B test a/c
Jul
1st opnl F-5B
CAT I TEST
Oct
Mar
CAT II/III TEST
Feb
Oct
FOLLOW-ON CAT II TEST
Nov
Sept
SKOSHI TIGER
Jul
Mar
Nov
May
Jul
Follow-on letter contract awards

Inclosure 6

M-16 CHRONOLOGY

SELECTED OT&E EVENTS OF VARIOUS AGENCIES



Inclosure 7

M-16 (AR-15) CHRONOLOGY

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1957	Stoner designs AR-15 at suggestion of CG, CONARC	
1958	Powell Board reviews entire Army rifle program; recommends retention of M14 and development of AR-15 type rifle	Army tests AR-15 and M-14 at Ft. Benning.
	Mr. Stoner makes minor modifications after Ft. Benning tests including two-piece handguard, modified safety, larger outside barrel diameter at muzzle, and buffer assembly modification by adding longitudinal guides for less bearing surface to prevent sand accumulation.	Results: AR-15 - 6.1 malfunctions/100 (3578 rounds fired) M-14 - 16 malfunctions/100 (2337 rounds fired)
	Mr. Macdonald of Couper-Macdonald, Inc., demonstrates M-14 and AR-15 in Asia and Europe.	
1959	First AR-15 sales: Malaysia (25), December 5, 1959.	
	Lubricant MIL-L-46000A developed for M61 20mm Gatling guns (adapted for M-16 in 1967).	
1960	AR-15 sales: Indonesia 1250, March 11, 1960.	July 4 - General LeMay personally shoots AR-15. Orders 3 for testing at Lackland AFB.
1961	December 27 - ARPA orders 1000 AR-15s for test by Vietnamese Armed Forces.	

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1962	May - Air Force procures 8500 AR-15s	February - Air Force tests Remington cartridge for AR-15.
	Spring - Air Force begins to replace M1/M2 carbine with AR-15 for security forces.	February to July - ARPA conducts combat condition field tests in Vietnam comparing AR-15, M1, BAR, and Thompson submachine gun.
	May - DoD procures 8500 AR-15s for Air Force.	One rifle for each 500 in 8500 rifle Air Force "buy" given 6000 round endurance test.
		May - Extensive testing shows no important technical advantage of M16 over M14 except light weight.
		August - ARPA report recommends adoption of AR-15 for RVNAF.
		September - OSD comptroller releases cost-effectiveness study comparing AR-15 to M14; concludes AR-15 is superior.
		October - SecDef directs Secretary of the Army to study effectiveness of AR-15, M-14, and AK-47 (Russian assault rifle).

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1962 (cont'd)		November, December - Army-wide Rifle Evaluation conducted by AMC (technical) and CDC (tactical). December - Rifle Evaluation investigated by Inspector General; concluded evaluation lacked objectivity and generally favored the M-14.
1963	Spring - M14 retained as standard Army rifle but decision made to procure 85,000 AR-15's for airborne and special forces units Springfield Armory ends its production of M14's Air Force procures 27,500 AR-15 rifles First Air Force procurement of M16 ammunition March - Army appointed executive agent for management of AR-15 system - Secretary of Defense states that a single version of AR-15 should be procured for all services - Technical Coordinating Committee (TCC) established to coordinate modifications of the AR-15 and its ammunition July - Secretary of Defense to procure the AR-15 and its ammunition for all Services	June - Frankford Arsenal studies AR-15 ballistics and recommends reduction of muzzle velocity requirements; TCC rejects recommendation

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1964	IMR 4475 (DuPont) and WC 846 (Olin) are approved for M16 ammunition	
	February - Army approved Colt's quality-assurance program	
	March - TCC subcommittee appointed to study proposed technical data package for M16 ammunition	Colt's reports to TCC that many of first production rifles for the Army exceed the maximum cyclic rate specifications; TCC increases this specification through July 1964
	- First M16's for Army off the production line	Air Force reports that Colt's endurance testing shows a malfunction rate of 1 per 3,000 rounds and parts replacement rate of 1 per 6,200 rounds (tests run with IMR 4475 propellant)
	June to December - Federal Cartridge Company and Olin-Mathieson load M16 cartridges with WC 846; Remington uses IMR 8136; this puts Army back to sole-source supply	December - Remington switches to WC 846 propellant; SAWS study begins (comprehensive review and evaluation of small arms for adoption during 1967-80)
1965	35,192 rifles procured primarily for the Air Force	
	February - Colt's quality-assurance program deemed satisfactory by Army; Army solicits new propellants for evaluation	

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1965	March - M16 deployed in South Vietnam with 173rd Airborne Brigade	May, June - Colt's traces the excessive cyclic rates to the use of WC 846 and asks TCC for waiver on upper limit; TCC refuses but Air Force accepts.
	November - Investigations requested of ammunition problems reported in SAWS tests.	September - New propellants tested at Frankfort.
	December - General Westmoreland requests that all US maneuver units in Vietnam be equipped with the M16.	November - SAWS reports that excessive cyclic rates and fouling were encountered with WC 846; no further waivers on cyclic rate specification and Colt's to use only IMR ammunition for acceptance tests.
	Colt's requested clearance to visit Vietnam to check M16 performance not granted.	December - Colt's reported that more than half the M16's using WC 846 would not meet cyclic rate specification while rifles using IMR propellants would meet this specification.
	New contract to Colt for 100,000 rifles: 68,000 for Army, 32,000 for Marine Corps.	Dri-Slide first sent to Vietnam in Christmas packages (a commercial lubricant).
	M16 orders reach 225,000	December, January - Frankfort Arsenal tests confirm SAWS study (see above).
		TCC concludes that the stoppage rate is not high enough to be unacceptable although corrections should be made.

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1966	January-December order for M-16s revised upward to 324,695 rifles. Colt's and TCC decide to develop a modified buffer system so that WC846 can meet specifications. April - DuPont's IMR 8208M accepted as the new M16 propellant. May - Production of ammunition loaded with IMR 8208M begins at Lake City and Twin Cities Armories. August - Issuance of the M16 to all Army maneuver units in Vietnam complete.	January to March - Colt's reports confirm relationship between propellant and stoppage rate. February - Evaluation of Dri-Slide and VV-L-800 lubricants at Rock Island Arsenal (RIA) March - Frankfort Arsenal instructed to continue M-16 propellant investigations. April - TCC approves use of IMR 8208M based on Frankfort tests. April, May - Springfield Armory tests show standard buffer and IMR 8136 better than new buffer and WC 846. Springfield Armory test reveals performance with modified buffer and ball propellant not as good as standard buffer and IMR 4 .6 propellant. May - First Marine Dri-Slide test recommends it as suitable for Marine Corps use. August - RIA Dri-Slide evaluation concludes Dri-Slide inferior in wear and corrosion resistance except in sandy environment. SAWS report submitted; includes problems with ammunition change.

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1966 (cont'd)		Fall - MACV informed of excessive malfunctions of M16; a survey concludes that training in maintenance and cleaning is needed. Arctic lubricants tests on MIL-L-141 / (LAWO; MIL-L-46000A (LSA), MIL-L-46010 (baked MoS_2 film, experimental esters) October - Technical assistance team to Vietnam from Colt's and WECOM finds that principal M-16 malfunction is failure to extract, possibly due to pitting and corrosion of chamber.
	December - Buffer modifications first incorporated into rifle production. M16 orders reach over 700,000.	December - In Colt's Tests with WC 846 and the new buffer system, the cyclic rate specification is met with both WC 846 and IMR propellants. Based on SAWS study Army plans to replace all .30-caliber rifles with M16's.
1967	January - Defense approval of replacing M1 and BAR but asks cost effectiveness study of M1, M14, and M16 inventories and evaluation of NATO implications of replacement of M14 with M16. Marines equip amphibious force with M16's. February - XM16E1 is classified standard "a" and designated M16A1 (Army's version of M16) March - Rifle inspection and repair program completed by all Army units.	

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1967 (cont'd)	April - Officially unsubstantiated reports of M16 malfunctions during taking of Hill 881 circulate.	April - TECOM starts testing lubricants for M16.
	May - Ichord Subcommittee begins investigation on the M16 rifle program.	May - DOD directs technical field evaluation of M16.
	Chrome plating of M16 chamber to eliminate corrosion approved for production.	June - Military Potential Test of Weapons Lubricants, a technical evaluation of Dri-Slide, MIL-L-46000A, VV-L-800, and NRL-4002-36 by TECOM, directed by Rock Island Arsenal, recommends MIL-L-46000A for M16A1 at temperatures above 0F; M16 revised maintenance instructions advise liberal use of lubricant.
	AMC team reports 10% of barrels need replacing each three months due to copper fouling and chambers pitting.	Repetition of Marine tests in late June recommends MIL-L-46000 for general use, Dri-Slide for sandy areas.
	Army approves modification.	August, September - Field survey in Vietnam reports malfunctions attributable to lack of maintenance, familiarity and instruction.
	June - First shipment of MIL-L-46000 to Vietnam.	October - DDR&E reports technical evaluation of M16, finds that new buffer is a marked improvement and satisfactory with either WC 846 or IMR propellant; malfunctions rates are approximately equal to M14 rates.
	January Defense study concludes that a one-rifle system based on M16A1 is most cost effective for the time period, 1969-1980.	
	July - Marine Corps announces MIL-L-46000A will replace VV-L-800 as standard lubricant and Dri-Slide will not be retained in supply system.	
	September - Chrome plated chamber put into production by Colt's.	
	MIL-L-46000A lubricant for M-16 to troops in Vietnam.	

Year	Weapons Development and Procurement	M-16 Test and Evaluation
1968	As a result of WSEG tests in Panama, use of IMR 8208M suspended. Technical data package for M16 delivered to Army by Colt. February - WSEG report issued. M16 Executive Committee is established (later renamed M16 Steering Committee) by Project Manager to improve communication between commands associated with M16 development. M16 Project Manager sends investigation team to Vietnam.	Deputy Secretary of Defense orders WSEG M-16 test as result of Ichord Subcommittee recommendations. January - Test report, "Commercial Weapons Lubricants" issued by RIA concludes that 90 to 95 percent of products evaluated are not suitable weapons lubricants on grounds of poor corrosion protection. Marine Corps carries out tests, directed by WSEG with IDA assistance, on M16 operational reliability under simulated Vietnamese environmental conditions (tests conducted in Panama). March - Battelle Memorial Institute study, "Analysis of Test and Selection Procedures for Small Arms Lubricants" begins. "Comparison Test for Cyclic Rate Comparison of Ball Cartridges in WSEG Weapons" released by TECOM.

APPENDIX G

OPERATIONAL TEST AND EVALUATION RANGES/FACILITIES

OPERATIONAL TEST AND EVALUATION RANGES/FACILITIES

INTRODUCTION

This Appendix presents the results of the OT&E Task Group's investigation of OT&E ranges/facilities. This investigation was limited in scope. A comprehensive study of the subject would require time and resources far beyond what was available to the Task Group. However, the investigation did produce much pertinent information which was useful to the overall OT&E study. A summary of these findings on OT&E ranges/facilities appears above (pp. 34-36).

The primary source of information consisted of interviews with personnel involved with OT&E both within the Services at all levels and within the Office of the Secretary of Defense. Additional information and data were obtained from visits to several selected OT&E facilities in the western part of the United States.

RESULTS OF INTERVIEWS

If appropriate to their experience and function, personnel interviewed by the Task Group were asked the question:

> What are your thoughts on test ranges and their control - national ranges, Service ranges, contractor ranges, methods of funding, methods of scheduling?

Summaries of interview responses to ten key issue questions are provided in Appendix E to this report. That portion summarizing responses to the question on OT&E ranges is extracted and included here.

> "Responses to this question varied somewhat according to the Service affiliation of the interviewee. In general, U.S. Army personnel considered their facilities adequate for OT&E . . . as did U.S. Navy personnel. U.S. Air Force responses indicated general satisfaction with R&D test facilities/capabilities but also cited OT&E ranges as limited in proper scope and instrumentation. In this regard, the Air Force proposed

concept for an extensive capability to conduct integrated offensive-defensive OT&E with sizable numbers of airborne systems in conjunction with realistic simulated threat situations (the HAVE EDGE study) was the subject of some comment. Although such a capability was considered ideal and certainly of far-reaching potential for needed mission-oriented OT&E, not all agreed that the concept was feasible within the present state-of-the-art of instrumentation or ability to construct an inclusive and realistically flexible threat environment.

"A serious problem of concern to most interviewees, regardless of Service, is the slow but continuing encroachment on range space and facilities by civilian communities, civil air desires, natural resource exploitation interests, and other interest groups outside of the Government. Many ranges have lost some flexibility to do comprehensive OT&E due to flight restrictions.

"In general, scheduling of Service ranges is not considered a major problem. Each Service feels its ability to control its ranges is essential for responsiveness. In addition, utilization of other Service ranges when necessary is not considered a major problem. Scheduling and reimbursement procedures are adequate and reasonably responsive.

"The need for national range resources is generally appreciated; however, these should be limited to those unique and costly resources of common use to all Service needs.

"Funding of ranges was the subject of extensive comment. Funding methods and procedures vary between and within the Services. Most felt that the Services should have the same type funding procedures. The majority opinion was for some level of effort Service funding as the best means of preventing loss of capability. However, there was some support for industrial funding as the best way to force planning and eliminate inefficiencies.

"Separate funding for OT&E (as a program element) was given some support. Identification of OT&E fund requirements by project was considered beneficial - particularly when the project required new facilities/capabilities."

ACTIVITIES WITHIN OSD CONCERNED WITH OT&E RANGES/FACILITIES

At the OSD level, there is an office concerned with DOD ranges: the Office of the Assistant Director (Ranges and Space Ground Support), Deputy Director (Strategic and Space Systems), ODDR&E. This is a relatively small office with only five professionals; however, it is responsible for:

> Reviewing and recommending policies, plans and programs pertaining to the ground environment support of national space and missile programs to include -
>
> > Development, procurement, allocation, management and operation of missile range and space tracking network instrumentation;
> >
> > Coordination of NASA and DOD range instrumentation and facility plans, and ground environment support. Monitors the programs and budgets of the National Missile Ranges.

This office is primarily concerned with National Ranges although it maintains cognizance of many Service ranges/capabilities to the extent possible with its limited manpower. It should be noted that this office is under a separate Deputy Director (Strategic and Space Systems) from the Office of the Assistant Director (Operational Test and Evaluation), which is under the Deputy Director (Administration, Evaluation and Management). This organizational separation introduces inevitable difficulties of communication and effective cooperation.

The Ranges and Space Ground Support Directorate does participate in meetings of the Range Commanders' Council and its various subgroups. The Range Commanders' Council is an unofficial body that arranges informally for dissemination of information in areas of mutual interest to the technical and working levels. This informal activity has had a beneficial effect on facilities. For example, the Inter-Range Instrumentation Group (IRIG) is recognized as an outstanding body in the field of

range tracking management. The IRIG has established telemetry standards that have been accepted by both Government and industry. Membership in the IRIG is not limited to National Ranges; many Service activities participate. House Report No. 1340, "Missile and Space Ground Support Operation", by the Committee on Government Operations, cited the Council and its subgroups as producing work

> ". . . characterized by objective and thorough exploration of matters. By contrast, the formal coordinating bodies frequently tackle a problem only after positions are hardened, and solutions come about largely through time-consuming bargaining and compromise . . ."

Other OSD activities have been involved with aspects of range/facilities documentation. For example, OASD (Installations and Logistics) has developed a computerized data base on existing ranges, with pertinent information on their current facilities, capabilities, and utilization. A first print-out of this data base was completed in June 1969. Although the document shows potential, it is incomplete in its present form. The OT&E Task Group believes that this data base should be expanded, hopefully in a more useful format, and updated at regular intervals.

It is evident that OSD attention to ranges and facilities is of a fragmented and incomplete nature. There seems to be little common direction or guidance provided to the interested parties (the National Range focal point, the I&L data base activity, and the OT&E function in ODDR&E). As far as ranges/facilities are concerned, the emphasis at the OSD level is certainly on National Ranges. Essentially, this means emphasis on missiles and space systems, since there are the primary areas of responsibility for the National Ranges. As a result, little regular attention is paid to tactical OT&E ranges/capabilities (aside from missiles that relate to tactical missions). Although the Services bear the responsibility for developing range capabilities adequate for supporting OT&E of their tactical systems, Service efforts in this regard might be assisted and improved by greater emphasis on tactical range matters at the OSD level. In particular, an OSD organization could act as a knowledgeable advocate of legitimate Service needs and provide high-level support when Service ranges are in jeopardy due to encroachment by non-Defense interests.

VISITS TO SELECTED RANGE ACTIVITIES

Three military members of the OT&E Task Group visited several ranges in order to obtain firsthand knowledge of current capabilities, limitations, and problems. Specific purposes of the visits were to obtain information concerning:

1. OT&E ranges and facilities, including scheduling and funding of tests.

2. Data collection and processing.

3. Analysis and evaluation.

The following facilities were visited:

Yuma Proving Ground Command, Yuma, Arizona (U.S. Army)
Naval Weapons Center, China Lake, California (U.S. Navy)
USAF Tactical Fighter Weapons Center, Nellis Air Force Base, Nevada (U.S. Air Force)
Pacific Missile Range, Point Mugu, California (National Range with U.S. Navy as Executive Agent)

In addition to those involved in managing these facilities, some testing organizations were also visited. These were the Navy Test Squadrons VX-5 (China Lake) and VX-4 (Point Mugu).[1/]

Some general observations based on the trip as well as some comments on individual facilities are given below.

1/ Relation of the VX Squadrons to U.S. Navy testing is covered in Appendix C, "Operational Test and Evaluation in the Navy and Marine Corps".

GENERAL OBSERVATIONS

Range Facilities

The various ranges had a great deal of capability for hardware item testing. There was some overlap and duplication; however, it did not appear to be unreasonable and was perhaps less than might have been expected.

There was much less capability for performing tests aimed at determining mission and combat effectiveness. This was primarily because of difficulties inherent in quantifying the differential effects of combat variables. It was also evident that there is currently less emphasis on this type of testing than would be desirable.

Ballistic missile testing was a case where it is virtually impossible to test in an environment which simulates combat employment, including enemy capabilities and reactions. The Navy is somewhat better off in that they can launch from any water position that does not require overflight of land areas. The Air Force is presently restricted to firing from Vandenberg Air Force Base. Although various improvements are being made to increase the degree of realism, the most valuable step - firing from operational sites - has not yet been approved.

Funding

This is an area where there are as many ways of operating as there are organizations. Some facilities find it difficult to achieve the proper balance between workload and capabilities and prefer a level-of-effort type funding (e.g., Yuma Proving Ground). Some like industrial funding since it reveals inefficiencies and forces planning (e.g., Naval Weapons Center). Other organizations believe that industrial funding would result in less and less utilization which might in turn cause deterioration and loss of capability (e.g., Pacific Missile Range).

Funding is an important problem area that needs high-level study and policy guidance. It is difficult to get a handle on the funding. Because each organization appears to do it differently and to have unique problems in computing overhead, etc., it is hard to make meaningful comparisons. The most attractive method of funding seems to be the way the National Ranges are now funded, rather than using industrial funding across the board.

A Possible New Range Activity at OSD

Service personnel almost unanimously considered this of doubtful value and/or potential. It was obvious, however, that they were particularly concerned that such an activity might become involved with control or direction of tests. There was general agreement that an OSD range activity could help to obtain required resources for the Services and to provide high-level DOD support against loss of range capabilities. The present informal set-up under the Range Commanders' Council, IRIG, and other committees was generally felt to be effective in arranging for dissemination of timely information to the technical and working levels.

At all ranges visited, supervisory personnel stressed that scheduling must be done at the local level if it is to be effective. No range reported any serious inter-Service problems with scheduling.

The following sections present certain selected information on the ranges/facilities visited in the course of this investigation. Emphasis is on significant capabilities and limitations which have general application to ranges/facilities suitable for supporting OT&E.

YUMA PROVING GROUND, YUMA, ARIZONA (U.S. ARMY)

Yuma Proving Ground covers about 1,500 square miles of desert land in the southwest corner of Arizona. It is the Army's desert environmental test center and performs both engineering and production type tests on automotive equipment, munitions and weapons, and air delivery materiel.

Comments

(1) Range facilities appeared to be excellent.

(2) Range facilities are used primarily for engineering and production type tests under desert conditions with a minimum of purely OT&E type testing effort. Some Army preliminary evaluations are being conducted on proposed weapon systems for the Cheyenne. Yuma does not simulate hostile environments by using ECM, since this type of equipment is available at Fort Huachuca.

(3) Scheduling of tests presents no significant problems. Normally, a customer submits a request for tests through TECOM and is assigned a priority coding I to VI. Suitability tests on developmental materiel are scheduled by TECOM in a similar manner. Daily/weekly test schedules are developed locally, based on priority and equipment availability. The Marine Corps utilizes Yuma Proving Ground for testing landing vehicles and weapons. The Navy has a permanent detachment stationed at Yuma to man a tracking station for them. Yuma works with China Lake and other Service testing facilities. For example, Yuma has run tests on a 16-inch gun and the Bullpup, both for the Navy.

(4) Funding: Thirty per cent comes from R&D direct funding to Yuma Proving Ground; the rest of the funds come from customer-funded test programs.

(a) Yuma prefers level-of-effort type funding rather than industrial or Service funding. In their opinion, the current accounting system is complicated enough and industrial funding would make it even worse.

(b) Current funding procedures make it difficult to keep a proper balance between workload and capabilities at Yuma. About one-third of their funds are provided in the RDT&E budget. The remainder fluctuate in a random fashion due to customer test programs. For example, the 3d Aviation Company now stationed at Yuma provides funds for about twenty-five per cent of the overall base operation costs. When this Company departs about 30 June 1970, Yuma will have a funding crisis until some way is found to make up this deficit. If no way is found, there may be a considerable reduction in force.

(5) Integrated Range Instrumentation Group (IRIG): The Yuma Proving Ground participates in meetings of the IRIG and feels that it is the best way to coordinate activities and efforts among the three Services. Formal supervision by OSD or the Army is not considered advantageous in this area.

NAVAL WEAPONS CENTER, CHINA LAKE, CALIFORNIA (U.S. NAVY)

The Naval Weapons Center at China Lake, California (approximately 155 miles northeast of Los Angeles, California) is an installation of the Naval Material Command and comprises the Naval Weapons Center, China Lake, and the Naval Weapons Center Corona Laboratories (at another Southern California location). The NWC is engaged in developing weapons and advanced weapons concepts. The China Lake facility consists of the Michelson Laboratories, the Naval Air Facility, and extensive ground, track, and aircraft test ranges. The majority of ranges are used for development testing. However, some OT&E is conducted here by VX-5 and fleet units. Of special applicability to OT&E are the COSO and Echo Ranges. The COSO Range is an instrumented facility that closely simulates a combat environment and target conditions (although no live ordnance is dropped). The Echo Range provides an extensive electronic warfare environment.

Comments

(1) Funding: The range at China Lake is industrially funded. They feel that this makes for more efficient management, although it is hard to compete with free ranges as they do have to hire and fire according to workload.

(2) Hostile Environment: The Echo Range simulates hostile environments and provides an excellent range to test the effectiveness of DECM gear as well as the tactics to be used. It also provides excellent development testing capability. Training of deploying pilots in the best use of their DECM gear is a secondary mission.

The COSO Range provides enemy vehicles, radars, etc., in a wooded or camouflaged complex to test the ability of a weapon system and pilot to acquire and attack enemy targets.

(3) Inter-Service Use of Range: The various ranges in the China Lake complex are used for development tests and evaluation. The other Services are welcome and do use the various ranges periodically. There have been no problems establishing priorities. However, other users have to be able to afford the cost of using an industrially-funded facility.

(4) Need for new range facilities and methods of controlling their use: The Naval Weapons Center sees a need to keep updating facilities to provide more realistic combat conditions. Control of use should be left at a local level. There are no inter-Service problems at that level.

(5) Scheduling: There is a scheduling conference with users every Thursday. Based on forecast workload and instrumentation required, the following week's schedule is planned. Priorities are seldom a problem and are solved by local arbitration. The schedule is very flexible. They are usually able to slip in another project if the one scheduled has to cancel. The policy is to accommodate all customers if they have the money.

(6) A small high-level testing agency might be of value in conducting large scale exercises to define information needed, tabulate and evaluate results, and most important, take necessary action to correct equipment deficiencies.

(7) There is a lack of information concerning what some of our complete systems can do under combat conditions. This needs high-level emphasis and representation, perhaps at the JCS level where the Services operate together. Any higher-level control tends to be less and less productive.

PACIFIC MISSILE RANGE, POINT MUGU, CALIFORNIA (NATIONAL RANGE)

The Pacific Missile Range is a designated National Range with the U.S. Navy as Executive Agent. The range headquarters is located at Point Mugu, California (approximately fifty miles north of Los Angeles, California). The ranges themselves consist of extensive airspace off the coast of California - including some portions of the Channel Islands - and an underwater range in the Hawaiian Islands. The offshore airspace is crossed in several places by civil airways; permission to use this airspace is granted to civilian use on an "as available" basis by the Pacific Missile Range.

Range clearance for water areas is maintained by dedicated resources (helicopters, etc.) that patrol the areas to be used and warn off any vessels that may be in a potential impact area.

Comments

The range facilities are outstanding. Ranges are used for development testing, OT&E testing and training. Scheduling is carried out in three phases:

(1) Long term - consists of planning and making arrangements for procurement of instrumentation peculiar to a planned project. Such instrumentation is funded by the Project Manager.

(2) Monthly and weekly conferences with users for short range planning.

(3) Daily rescheduling insofar as possible to substitute for cancelled events. Priorities are determined by the Pacific Missile Range in arbitration with users; there have been no problems to date. Air Force users account for approximately twenty-eight per cent, mostly missile firing; NASA, contractors, and various other agencies approximately twelve per cent; the remainder is used by the Navy. It was stressed that scheduling has to be done locally for efficient use of the range. Funding is provided by the Naval Air Systems Command for level-of-effort plus a small amount for range improvements.

Problems

(1) Encroachment by new Los Angeles Airport and overseas airways traffic.

(2) Oil drilling and exploration rigs.

(3) Proximity of tests to Russian electronic information gathering ships off the coast.

USAF TACTICAL FIGHTER WEAPONS CENTER, NELLIS AIR FORCE BASE, LAS VEGAS, NEVADA

The USAF Tactical Fighter Weapons Center at Nellis Air Force Base, Nevada, has the dual mission of training tactical fighter pilots (including the development of tactics and doctrine) and OT&E. The Nellis Air Force Base ranges lie to the north and east. There are

significant amounts of airspace and ground available for a variety of capabilities. Because Nellis Air Force Base has in the past been primarily involved with training missions, the ranges were so developed to fulfill training requirements. At present, the Tactical Fighter Weapons Center has one range, Range 3, dedicated to formal OT&E.

Comments

(1) Range facilities for OT&E are quite primitive. However, they do have a program for improvement that could provide a good capability if sufficient funds are provided.

(2) The Tactical Fighter Weapons Center philosophy is that OT&E must be responsive to urgent needs, and therefore ranges must be equally responsive. The capability to use ranges for both testing and training is necessary for their mission. They do not think an OSD central activity would enhance responsiveness to the users' needs - for development, yes, but not for OT&E.

(3) Tactical Fighter Weapons Center personnel appreciate the capabilities of nearby ranges such as the Naval Weapons Center and the Pacific Missile Range. However, the Naval Weapons Center is costly, and use of the Pacific Missile Range presents problems in overflight and staging that increase costs and limit responsiveness.

APPENDIX H

BIBLIOGRAPHY (INCLUDING LIST OF BRIEFINGS PRESENTED TO OT&E TASK GROUP)

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"Analysis of Test and Selection Procedures for Small Arms-Lubricants," Report No. RACIC-TR-61, prepared for Office of Advanced Engineering, Advanced Research Projects Agency, DoD, by RACIC, Battelle Memorial Institute-Columbus Laboratories and A. D. Little, Inc., Contract No. F33657-67-C-0810, 10 June 1968 (FOR OFFICIAL USE ONLY)

Reviews the history of the M-16 rifle and of the various small arms lubricants. Results of combat experimentation with other than the specified lubricant are reported. Small arms development cycle is described. There is an extensive bibliography on the M-16.

"Army's 'Unbelievable' Mismanagement Caused M-16 Rifle Problems, Armed Services Subcommittee Found," Press Release by U.S. House of Representatives, Committee on Armed Services, 90th Cong., 19 Oct 1967

Summarizes findings of the House Armed Services Subcommittee investigating the M-16 malfunctions in Southeast Asia.

"Bat Bulletin: The VX-5 Newsletter," Air Test and Evaluation Squadron FIVE, U.S. Naval Air Facility, China Lake, Calif.

This newsletter is distributed to Navy operational units and contains up-to-date information derived from VX-5's tests and evaluations which would assist those units in training for and performing combat missions.

"Bibliography on JTF-2" prepared by Director of Operations, Headquarters USAF, Feb. 1969

An annotated bibliography for internal use includes reports on formation of JTF-2, terms of reference, programs and funding; exchange of information with the UK, tests and related data. Copy on file in AFXOW.

"Concept for a Program of Strategic Low-Altitude Penetration Tests (U)," Supplement 1 to WSEG Report 74, Weapons Systems Evaluation Group, DoD, June 1964 (SECRET)

Provides a concept and integrated test program for weapons systems tests.

"Concepts for a Program of Tactical Low-Altitude Penetration Tests (U)," WSEG Report 74, Weapons Systems Evaluation Group, DoD, May 1964 (SECRET)

Provides a concept and integrated test program for weapons systems tests.

"Conduct an Operational Evaluation of the Helmet Sight In An F-4 Aircraft As An Acquisition Aid During Air Combat Maneuvering (U)," First Partial Report on Project O/V63 Task II Annex A, Department of the Navy, Operational Test and Evaluation Force, Norfolk, Va., 6 Oct 1969 (CONFIDENTIAL)

Report on a recent test conducted by the Navy's Operational Test and Evaluation Force. Cited as representative of the activities encompassed by OPTEVFOR's mission.

"Department of the Navy RDT&E Management Guide," NAVSO P-2457 (Rev. 7-69), Dept. of the Navy, Office of Asst. Secretary of the Navy (R&D), Washington, D. C., 1 July 1969

Provides a summary overview of Dept. of Navy RDT&E "machinery," and is a handy source of general information concerning RDT&E organization, procedures and references to official sources.

"Defense Science Board Task Force on R&D Management," Preliminary Draft of Final Report, Office of Director Defense Research and Engineering, Aug 1966

Addresses the acquisition management practices of the DOD with emphasis on the R&D aspects. Major focal points of discussion were prototypes, requirements, concept formulation in relation to development needs and contracting flexibility. Also addressed was DOD management in the weapon system acquisition process, development of a management model, budgeting and costing.

"Determination of USAF Testing Policies and Concepts Which Best help to Achieve Operationally Effective Weapons and Equipment," Thesis by Col. C. W. Lutz, USAF, submitted to George Washington University, 1959

A thesis-form discussion of the problem written by Colonel Lutz as a part of his requirements for an advanced degree at George Washington University. Although written in 1959, much of Colonel Lutz's material and rationale is pertinent to present-day weapon system evaluation philosophy. The basic requirement for test of Air Force equipment, a survey of test objectives, concepts, and policies, and conclusions and recommendations for optimum test management doctrine are offered. Support for his findings is given in an analysis of a sampling of opinion of test-experienced people on the staff of Headquarters, USAF. Comparison of testing methodologies of various foreign military aeronautical organizations as well as U. S. Civil Aviation authority is offered.

"Documentation Aids for CINCSTRIKE Test and Evaluation Plan," prepared by Spindletop Research, Inc. for Headquarters, USAF Tactical Air Warfare Center, Eglin Air Force Base, Fla., Contract No. AF 08(635)-4129, 1 June 1964 (FOR OFFICIAL USE ONLY)

A compilation of references on FIRE SUPPORT, RECONNAISSANCE, TACTICAL AIR MOVEMENT, STRATEGIC AIR MOVEMENT, COMMAND AND CONTROL, and AIRCRAFT VULNERABILITY/SURVIVABILITY. The purpose was to provide basic reference information for the newly-organized Air Force Tactical Air Warfare Center.

"DoD Operational Test & Evaluation Report," unpublished working paper by Dr. Wm. Pettijohn, no date (TOP SECRET)

Working paper includes:

1. Case Studies - M151 ¼T. Truck (FOR OFFICIAL USE ONLY) Short Range Ground Surveillance Radars (CONFIDENTIAL) Tactical Surface-to-Air Missiles (SECRET); Strategic Missile Testing (TOP SECRET)
2. "Section VI: Conclusions," from a Report of JTF-2 Experiment 4.1 (In-House Comments), no date (UNCLASSIFIED)
3. "Field Experimentation and Small Arms Evaluation: A Case in Point Regarding the Future of Military System Analysis," by J. A. Stockfisch, unpublished paper which is a revision and expansion of a paper presented to Military Applications Section of the 31st Meeting of ORSA in New York, 2 June 1967 (UNCLASSIFIED)
4. "Operational Test & Evaluation in the Services," by W. Pettijohn. (Source: "Study of Army Test and Evaluation," May 1966 - a comparison of the three Services. (FOR OFFICIAL USE ONLY)
5. "The Army's Weapon System Studies, Test & Evaluation (U)," author unknown, paper dated 15 June 1967 (FOR OFFICIAL USE ONLY)
6. "Instrumentation," by W. Pettijohn (FOR OFFICIAL USE ONLY)
7. Time Schedule FY 69-73 for Various Systems from Production Time Through Time in Procurement Channels (UNCLASSIFIED)
8. "AFWET Instrumentation System," Eglin Air Force Base, Fla., 1 July 1967, 17 p. (UNCLASSIFIED)
9. "JTF-2 Instrumentation," excerpt from another unidentified report, 5 p. (UNCLASSIFIED)
10. Conclusions & Recommendations by W. Pettijohn (FOR OFFICIAL USE ONLY)

These papers were assembled by Dr. Pettijohn while he was Special Assistant for Operations Test and Evaluation, OASD (Systems Analysis). They were assembled in 1968, for the most part.

"Evaluation Methods for CINCSTRIKE Test and Evaluation Plan," prepared by Spindletop Research, Inc. for Headquarters, USAF Tactical Air Warfare Center, Eglin Air Force Base, Fla., Contract No. AF 08(635)-4129, April 1964 (FOR OFFICIAL USE ONLY)

Describes testing, war games, and analytical studies by which the Air Force's Tactical Air Warfare Center proposed to support CINCSTRIKE in conducting COLD FIRE I.

"Hearings Before the Special Subcommittee on the M-16 Rifle Program of the Committee on Armed Services," No. 19, U. S. House of Representatives, 90th Cong., 1st Sess., May 15, 16, 31, June 21, July 25, 26, 27, Aug. 8, 9, 22, 1967

Summarizes months of study including field investigations in South Vietnam and extensive hearings in Washington on M-16 malfunctions. It includes testimony from the inventor, manufacturers representatives, cartridge propellant representatives, Army program managers and combat personnel.

"Integrated Management of Test and Test Support Capabilities," Thesis by Charles H. Ham, submitted to Graduate School of Florida State University, April 1963

Examines the feasibility and desirability of alternative methods of achieving the integrated management of the test and test support capabilities of a major U. S. Air Force R&D test organization. At the time the research was done, the author had more than 20 years' experience in administering OT&E projects and facilities.

"JCS JTF-2 Final Report (U)," Joint Task Force, Sandia Base, New Mexico, December 1968 (SECRET)

Summarizes history and testing program of JTF-2.

"Journal of Defense Research, Series B: Tactical Warfare (U)," Vol. 1B No. 3, Fall 1969, published by Institute for Defense Analysis for ARPA, DoD, Washington, D. C. (SECRET)

This issue is devoted exclusively to a series of papers dealing with remote - sensors technology applicable to counter infiltration problems and tactical battlefield problems. This overall program is managed by the Defense Communications Planning Group (DCPG), and the genesis of the concept and the origins of DCPG are recorded.

Letter to M. E. Marston, OSD Blue Ribbon Defense Panel, Wash., D.C. from RACIC Battelle Memorial Institute, Columbus Laboratories, Reference: R-3295, 18 Dec. 1969, with enclosures:
Enclosure 1 -"Bibliography--M16 Rifle Test and Evaluation"
Enclosure 2 -Letter to LtC W. J. Lynch, ARPA, Wash., D.C. from R. W. MacDonald, Cooper-Macdonald, Inc., Baltimore, Md., 10 Nov 1961, with enclosures:
Enclosure 1 - "History of AR-15"
Enclosure 2 - Set of Pictures

Letter forwards additional bibliography to that in RACIC-TR61, "Analysis of Test and Selection Procedures for Small Arms Lubricants," and a letter from Mr. Macdonald, President of Cooper-Macdonald, Inc. The latter summarizes history through 1961 of the AR-15 (commercial name for the M-16) development. It summarizes results of Service comparative tests and initial world-wide sales efforts.

"Operational Reliability Test M-16A1 Rifle System," WSEG Report 124, Weapons Systems Evaluation Group, DoD, Feb 1968 (FOR OFFICIAL USE ONLY)

Describes an operational test carried on by the U.S. Marine Corps under WSEG supervision in Panama, to measure the operational reliability of the M-16A1 rifle systems. The M-14 rifle system was included in the test as a control. Three types of M-16A1 rifles were used and two types of cartridge propellant. 328 USMC riflemen each fired 480 rounds/day for three days in each of four differing environments using 447 rifles.

"Papers Concerning TAWC Vulnerability/Survivability Evaluations," prepared by Spindletop Research, Inc. for Headquarters, USAF Tactical Air Warfare Center, Eglin Air Force Base, Fla., Contract No. AF 08(635)-4129, June 1964 (FOR OFFICIAL USE ONLY)

Deals with the problems associated with aircraft vulnerability which an operational testing organization must face and solve. Also contains a bibliography on vulnerability/survivability which contains 274 references.

"Papers Exemplifying Field Test (Exercise); Data Collection Concepts," prepared by Spindletop Research, Inc. for Headquarters, USAF Tactical Air Warfare Center, Eglin Air Force Base, Fla., Contract No. AF 08(635)-4129, May 1964

A compilation of various papers prepared for the Commander, Tactical Air Warfare Center, TAC, during the period (1964) when TAWC was involved in preparing for the Joint Army-Air Force exercises which were designated GOLD FIRE I and GOLD FIRE II. They deal mainly with methods of obtaining quantitative data from large-scale field exercises and cover such activities as Fire Support, Reconnaissance, and Logistical Support.

"A Perspective: Air Force Testing and Evaluation," by Charles C. Ham, in Tactical Air Warfare Center Quarterly Report, Dec. 1969

Represents an overview of the current Air Force testing concept and presents a rationale for a possible re-structuring. The author bases his views on what he regards as redundancies and unnecessary complexities in the managing and conduct of today's test and evaluation program in the Air Force.

"Planning Within the Department of Defense (U)," Working Paper, Report by Military Aircraft Panel of President's Science Advisory Committee, 18 April 1969, 23 p. (CONFIDENTIAL)

On 11 Aug. 1969 this report was forwarded to the Secretary of Defense by Dr. DuBridge, the President's Science Advisor, with the comment that Mr. Laird might wish to make it available to the "Fitzhugh Commission." It has a section devoted to an assessment of military operational testing and evaluation.

"Project Deseret Project Master Plan (PMP)(U)," RCS: AMC PM-101, Project Deseret Test Center, Ft. Douglas, Utah, 30 Sept. 1969, circa 75p. (SECRET)

Gives history, organization and schedule for Deseret Test Center.

"Project MASSTER (U)," Briefing presented to DoD Sensor Aided Combat Symposium, at National Bureau of Standards, Gaithersburg, Md., by Maj. Gen. John Norton, U.S. Army, Deputy Director, Project MASSTER, Jan. 1970 (CONFIDENTIAL)

Explains mission and tentative approach to testing of Advanced Sensors in a combined arms environment.

"Project MASSTER Organization Chart," effective 6 Jan 1970

"A Prototype Strategy for Aircraft Development (U)," Memorandum RM-5597-PR, by Robert L. Perry, RAND Corporation, April 1968 (CONFIDENTIAL)

An examination of the conditions that warrant the use of a prototype strategy in the development of military aircraft. Examples are given, based on recent experience both in the U.S. and abroad. Attention is given to the management approach that is most appropriate to a prototype strategy.

"Report of the Panel on R&D Management," 1969 Summer Study, Defense Science Board, Office of the Director, Defense Research & Engineering, Newport, Rhode Island, 6-18 July 1969

Study formulates specific actions which OSD could consider taking to implement the recommendations of the DSB Task Force on R&D Management. Consists of a summary with recommendations for action together with discussion, and several supporting papers on the principal issues.

"The Role of Competition in Aeronautics," presented by G. S. Schairer, The Boeing Co., at The Wilbur and Orville Wright Memorial Lecture of the Royal Aeronautical Society, London, England, 5 Dec 1968

Emphasizes that competition is a very important factor in achieving aeronautical advances - that competition results in the customer receiving more for his money. Competition can be limited to paper studies, to prototypes, or continued throughout production. Paper competitions assume that people get smart by studying. Prototype competitions add the smartness learned only by doing.

"A Study of Army Test and Evaluation (SATE)," Volume II: Summary and Section V, Improvement Actions, Department of the Army, Office of Chief of Staff, Systems Analysis Group, May 1966 (FOR OFFICIAL USE ONLY)

Volume II provides a summary of the SATE study effort and a detailed discussion of the eight improvement actions. Provides background information as to the alternatives available in 1966 for revised Army testing organization and procedures.

"Test Capabilities at Yuma Proving Ground (Revised Edition)," Department of the Army, Yuma Proving Ground, Yuma, Arizona, October 1968

Provides detailed description of the extensive test facilities and capabilities at Yuma Proving Ground, Arizona.

"U.S. Air Force Tactical Air Support Requirements Board Comments on Report of Army Tactical Mobility Requirements Board (U)," 4 Volumes, Department of the Air Force, The Tactical Air Support Requirements Board, Washington, D.C., 14 August 1962 (SECRET)

This report was prepared by a board of general officers chaired by (then) Lt. Gen. Disoway. It is a critique of the Army's "Howze Board" report and also contains results of Air Force studies and tests relating to the Air Force's capabilities to contribute to Army air mobility.

"Weapons Systems Evaluation Group," Weapons Systems Evaluation Group, Department of Defense, no date, 9p.

An information brochure for new WSEG personnel which summarizes WSEG origin and history, relationships to DDR&E and JCS, contractor relationship and support, and nature of operational evaluations.

BRIEFINGS ATTENDED BY THE OPERATIONAL TEST & EVALUATION TASK GROUP OF THE BLUE RIBBON DEFENSE PANEL STAFF

Army or Army Affiliated

"The Role of the United States Army Materiel Command in Army Operational Test & Evaluation," presented by LTC Curtis Amende, Deputy Chief of Test & Evaluation Division, Headquarters, Army Materiel Command, Washington, D. C.

"The Role of the United States Combat Development Command in Army Operational Test & Evaluation," presented by Mr. Jack Harris, Plans & Programs Division, Combat Development Command, Ft. Belvoir, Va.

"United States Army Test & Evaluation Command," presented by Mr. Benjamin S. Goodwin, Special Assistant to the Commanding General, Test & Evaluation Command, Aberdeen Proving Ground, Md.

"Yuma Proving Grounds Test Operations," presented by Mr. Floyd Watts, Technical Advisor, Yuma Proving Grounds, Yuma, Arizona.

Navy and Marine Corps or Navy Affiliated

"Naval Operational Test and Evaluation," presented by CAPT James L. Anderson, Director, Surface Warfare Division; CAPT Richard W. Huxford, Director, Air Warfare Division; and CDR Rudolph L. Krause, Head, Fighter Weapon Section, Air Warfare Division, Operational Test & Evaluation Force, U. S. Naval Base, Norfolk, Va.

"Naval Weapons Center," presented by CAPT J. K. McConeghy, Jr., Executive Officer; Mr. H. J. Wilson, Deputy Technical Director; Mr. C. J. DiPol, Associate Dept. Head (Operations); Dr. I. E. Highberg, Head, Systems Development Dept., Naval Weapons Center, China Lake, California.

"Operational Test & Evaluation in the United States Marine Corps," presented by COL E. J. Maloney, Assistant Deputy Chief of Staff (RD&S), Headquarters, U. S. Marine Corps, Washington, D. C.

"Pacific Missile Range Facilities," presented by CAPT R. T. Janiec, Range Operations Officer, Pacific Missile Range, Pt. Mugu, California.

"Pacific Missile Range Operation," presented by RADM Howard S. Moore, Commander, Pacific Missile Range, and CAPT J. D. Mooney, Director, Pacific Missile Range Directorate, Pt. Mugu, California.

"Testing Philosophy," presented by CAPT George Watkins, Deputy Director, Naval Air Test Center, Patuxent River, Md.

"VX-4 Projects and Testing Philosophy," presented by CAPT James Foster, Commanding Officer, VX-4-NAS, Pt. Mugu, California.

"VX-5 Operations and General Testing Philosophy," presented by CAPT Charles Fritz, Commanding Officer, VX-5-NAS, China Lake, California.

Air Force or Air Force Affiliated

"HAVE EDGE," presented by Mr. Howard A. Beck, Chief, Resources Branch, Evaluation and Resources Group, Deputy Director for Operational Test and Evaluation, DCS/Plans & Operations, Headquarters, USAF, Washington, D. C.

"Strategic Missile Operational Test & Evaluation," presented by Lt. Col. Edgar A. Northrup, Jr., Strategic Division, Directorate of Operations, Headquarters, USAF, Washington, D. C.

"United States Air Force Operational Test & Evaluation," presented by Lt. Col. Malcolm Agnew, Deputy Chief, Evaluation & Resources Group, Office of the Deputy Director for Operational Test & Evaluation, DCS/Plans & Operations, Headquarters, USAF, Washington, D. C.

Other

"General Motors Proving Ground Operations," presented by Mr. C. J. Brady, Manager, General Motors Proving Grounds, Milford, Michigan.

"The Operational Test and Evaluation Study Conducted by WSEG Study Group," presented by Dr. Robert Fox, Director, Science & Technology Division, Institute for Defense Analyses, Arlington, Va.

"Overall View of General Motors Engineering Concept," presented by Mr. L. A. Kintigh, Vice-President, General Motors Engineering Staff, General Motors Technical Center, Warren, Michigan.

"Research, Development, Test and Evaluation Policies Within General Motors," presented by Mr. K. E. Brooker, Manager, Engineering Staff Operations, General Motors Engineering Staff, General Motors Technical Center, Warren, Michigan.

"The Weapons Systems Evaluation Group," presented by Col. Clifford Moore, Jr., USAF, Weapons Systems Evaluation Group, Department of Defense, Washington, D. C.